Does dissociation mediate the relationship between childhood abuse and auditory hallucinations? An investigation using clinical samples with schizophrenia and dissociative identity disorder.

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Abstract

Previous research has found that the relationship between childhood trauma and auditory hallucination is mediated by dissociation (Perona-Garcelan et al., 2012a, 2014) and that the specific types of dissociation that mediate this relationship are depersonalisation and absorption (Cole et al., 2016; Perona-Garcelan et al., 2012a, 2014). The current study aimed to extend this literature base by testing dissociation as a mediator of the relationship between childhood abuse and auditory hallucination frequency and associated distress using two diagnostic groups; DID (n = 50) and schizophrenia (n = 50). In addition, this study aimed to test whether dissociation is a mediator of the relationship between childhood abuse and non-auditory hallucinations. The battery of quantitative questionnaires included those assessing childhood abuse, different manifestations of dissociation (e.g., pathological dissociation, depersonalisation), auditory hallucination frequency and distress and non-auditory hallucinations In the DID group depersonalisation mediated between childhood abuse and distress associated with auditory hallucinations. Childhood abuse and auditory hallucination frequency was mediated by pathological dissociation in the DID group and was mediated by depersonalisation in the schizophrenia group. Also, childhood abuse and non-auditory hallucinations were mediated by dissociation in all modalities in the schizophrenia group and all except gustatory in the DID group. This study builds on the research demonstrating that in essence auditory hallucinations are dissociative and adds that non-auditory hallucinations can also be conceptualised as dissociative.

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Overview

Auditory hallucinations have previously been assumed in some areas of psychiatry to be the sole domain of schizophrenia (Moskowitz, Shafer & Dorahy, 2008). However, research has challenged this assumption by evidencing that auditory hallucinations are experienced both by people with no clinical diagnosis and by people experiencing a wide range of psychiatric illnesses (Longden, Madill & Waterman, 2012; Pilton, Varese, Berry & Bucci, 2015). This has prompted research examining the correlates of voice hearing in both schizophrenia and other psychiatric groups.

This study will test the model of auditory hallucinations as a dissociative experience, posited by Moskowitz and Corstens (2007), by extending the work of Perona-Garcelan et al. (2012a) who found that dissociation was a mediator of the relationship between childhood trauma and auditory hallucinations in non-clinical and schizophrenia groups. The current study assessed if this mediated effect was evident in schizophrenia and dissociative identity disorder (DID) groups. It also considered what elements of auditory hallucinations are mediated by dissociation by looking at frequency and distress. This will expand understanding of the similarities and differences in the phenomenology of auditory hallucinations in different psychiatric groups, and whether dissociation generally underpins them.

This chapter defines both auditory hallucinations and dissociation, then moves into closer examination of the relationships between the three variables of interest; auditory hallucinations, dissociation and childhood trauma. The chapter will then review studies that have tested the mediation model. It will briefly consider non-auditory hallucinations and

whether the mediation model holds true across different hallucination types. It will close with a closer look at the present study and the associated hypotheses.

Auditory Hallucinations

There are many definitions of auditory hallucinations that have been offered. Pilton et al. (2015, p.139) defined auditory hallucinations as, "the experience of hearing a voice in the absence of an appropriate external stimulus". David (2004) proposed that auditory hallucinations need to occur while the person is awake, that the person experiencing the hallucination is not aware of having explicit control over the hallucination, the experience needs to happen without sensory stimulation that could explain the hallucination and be real enough that the person experiencing it could reasonably believe that it is real.

Another description concentrates on some essential characteristics of auditory hallucinations that have been discovered through phenomenological enquiry; the content of the voices has a personal meaning to the hearer, the voices have an identity either specific or general that has been appointed to the voice by the hearer, there is a pattern in how the voice hearer relates to the voices which may be stable or fluid over time, hearing voices has a marked influence on the life of the voice hearer either positively or negatively, and voice hearers acknowledge that hearing voices feels real, even when they also acknowledge that they cannot be real (Beavan, 2011).

Prevalence rates for hearing voices vary greatly depending on how hearing voices is defined. A review of prevalence studies found that prevalence rates vary from 0.6% to 84% (Beavan, Read & Cartwright, 2011). The higher percentages included auditory hallucinations that were related to sleep; thus, the median prevalence rate may give a better sense of how common this phenomenon is at 13.2% (Beavan et al., 2011). It is worth noting that in the New Zealand context the experience of voice hearing is commonly seen as part of everyday life for NZ Maori (Taitimu, 2008).

These rates indicate that hearing voices is not only experienced by people with a psychotic disorder, as schizophrenia has prevalence rates between 0.3% and 0.7% (American Psychiatric Association, 2013). Other studies have found that there are a significant number of people who hear voices that do not have a psychiatric diagnosis and do not experience distress related to their experience of hearing voices (de Leede–Smith & Barkus, 2013; Longden et al., 2012; Pilton et al., 2015; Sommer et al, 2010).

When auditory hallucinations are associated with a psychiatric diagnosis they are associated with high levels of distress and reduction in functioning (Pilton et al., 2015). While auditory hallucinations have long been considered to be pathognomonic of schizophrenia they are also common in dissociative identity disorder, depression, post-traumatic stress disorder, borderline personality disorder and bipolar disorder (Longden et al., 2012; Pilton et al., 2015).

There have been many theories posited to explain auditory hallucinations. One is a cognitive theory that indicates that people who experience auditory hallucinations have a cognitive bias towards interpreting internally generated cognitions as external in origin (Varese, Barkus, & Bentall, 2012). Further to this cognitive theory is that dysfunctional metacognitions like the belief that thoughts need to be controlled, when coupled with intrusive thoughts can cause cognitive dissonance (Perona-Garcelan et al., 2012b). Cognitive dissonance is when two beliefs or thoughts are held that are not consistent with each other, this causes the person distress and they will endeavour to try and resolve this discomfort (Perona-Garcelan et al., 2012b). One of the ways that dissonance between metacognitions and intrusive thoughts can be resolved is to give thoughts an external origin (Perona-Garcelan et al., 2012b). Moskowitz and Corstens (2007) put forward another theory to account for auditory hallucinations. They argue that auditory hallucinations are dissociative in nature and are best understood as a dissociative experience and not a psychotic one. This theory is also

advocated by Longden et al. (2012). The research corroborating this claim is covered in some depth later in this chapter.

Link between Childhood Abuse and Auditory Hallucinations

Historically schizophrenia and hearing voices have been conceptualised as a biomedical disorder and have been treated with medication (Ross, 2007). This has meant that the relationship between childhood trauma and auditory hallucinations has only begun to be investigated more recently (Ross, 2007). There is now widespread evidence that childhood trauma is associated with higher incidences of auditory hallucinations (Kilcommons, Morrison, Knight, & Lobban, 2008; McCarthy-Jones, 2018; Morrison, & Peterson, 2003; Muenzenmaier et al., 2015; Offen, Waller, & Thomas, 2003; Read, Agar, Argyle, & Aderhold, 2003; Read, Van Os, Morrison, & Ross, 2005; Shevlin, Dorahy, & Adamson, 2007; Shevlin et al., 2011; Whitfield, Dube, Felitti, & Anda, 2005).

Read et al. (2003) conducted a file review looking for evidence of trauma in 200 people using a community mental health service in New Zealand. Of all 200 files, 46% had a trauma history noted. They found that of those people who had a history of childhood sexual abuse, 52% had the documented presence of auditory hallucinations, this was in comparison to 18% of people with no trauma history (Read et al., 2003). They also found that auditory hallucinations were significantly more likely to be noted in the files of people who had experienced childhood sexual abuse, childhood physical abuse and adult sexual abuse than those with no trauma noted or those with adult physical abuse noted (Read et al., 2003). Experiencing voices commenting and command hallucinations were also found to be significantly more likely to be noted in a file where trauma was also evident.

Hardy et al. (2005) conducted a phenomenological study with 75 people who experience psychosis and found 40 people (53.3%) had experienced trauma. Within those that had experienced trauma over half experienced hallucinations that were similar in theme to

their trauma (Hardy et al., 2005). In addition, they found that sexual abuse and bullying were the traumas most linked with hallucinations (Hardy et al., 2005).

Romme and Escher (1989) interviewed people who heard voices (N=20) and found that 70% of the people interviewed attributed the onset of their voices to a traumatic event. People that attributed their voices to a traumatic event either found them positive and part of the healing process or negative and aggressive (Romme & Escher, 1989).

Bless et al. (2018) separated people in a non-clinical sample who experience auditory hallucinations into two groups based on whether the onset of the voices was associated with adverse life events or not. They found that people in the group where the onset of auditory hallucinations was associated with adverse life events were more distressed by the auditory hallucinations and more likely to have contact with a mental health professional than people in non-adverse life event group (Bless et al., 2018).

Research has found a particularly strong link between auditory hallucinations and childhood sexual abuse. Childhood rape increased the likelihood of experiencing auditory hallucinations 3.5 times and significantly raised the odds ratio of having auditory hallucinations (Shevlin et al., 2007; Shevlin et al., 2011). Kilcommons et al. (2008) interviewed a group of 40 people who had survived child sexual abuse and found 46% of them either currently or historically experienced auditory hallucinations. They also found that the rates of auditory hallucinations were significantly higher in the sexual abuse survivor group than the control group (Kilcommons et al., 2008). Bentall, Wickham, Shevlin, and Varese (2012) found that people who had been raped were six times more likely to experience an auditory hallucination in the last 12 months. This increased likelihood held even when demographics and cognitive ability (Intelligence Quotient scores) were controlled for. This tendency for sexual abuse and auditory hallucinations to have a positive relationship is not limited to studies with psychotic populations, it also holds true for other psychiatric

diagnoses like bipolar disorder and in non-clinical populations, like homeless young people in Los Angeles (Read et al., 2005). Offen et al. (2003) found that the younger a person is when the first instance of sexual abuse occurs the more likely they are to perceive their auditory hallucinations to be malicious.

Another pattern in the research on childhood trauma and auditory hallucinations is the dose-response relationship. Muenzenmaier et al. (2015) found that a further stressful childhood experience increased the likelihood of experiencing a hallucination by 1.2 times. Each additional adverse childhood experience raises the likelihood of hallucinations by 1.2-2.5 times, more than six adverse childhood events raises that likelihood of experiencing hallucinations 5 times (Whitfield et al., 2005). The number of different abuse types that have been experienced is positively correlated with the number of positive psychotic symptoms (Read et al., 2003; Shevlin et al., 2007).

The research on the relationship between trauma and auditory hallucinations is best summarised by a quote from the research of Honig et al. (1998), "in most patients, the onset of auditory hallucinations was preceded by either a traumatic event or an event that activated the memory of earlier trauma" (p. 646).

Dissociation

The construct of dissociation is based on the seminal work of Pierre Janet, who explains dissociation as related to integration failures in psychobiological regulation systems, including those associated with consciousness (Van der Hart & Horst, 1989). This lack of integration leads to separate parts of the personality that disrupt each other and take control of behaviour. Janet talks about these parts of consciousness being on a spectrum of complexity from a discrete trauma memory and its associated emotions and physical sensations right through to full personalities as seen in dissociative identity disorder (DID), formerly called multiple personality disorder (Van der Hart & Horst, 1989). More recent definitions of

dissociation have built on Janet's work and consider there to be two specific types of dissociation; detachment and compartmentalisation (Holmes et al., 2005). Detachment includes the experiences of depersonalisation and derealisation. Depersonalisation is the experience of a separation from a person's sense of self (i.e., alterations in one's perception of their self), and derealisation is the experience of a separation from the external world (i.e., alterations in one's perception of the world; Holmes et al., 2005). Compartmentalisation refers to experiences where an aspect or aspects of psychobiological functioning (e.g., memories, feelings) become separated to the point that they are not able to be accessed or controlled by will, such as is evident in dissociative amnesia (Holmes et al., 2005). Compartmentalisation has also been referred to as structural dissociation (Dorahy & Palmer, 2015). DID is the most sophisticated form of compartmentalisation and is a disorder which affects integration of self, personality and memory. The Diagnostic and Statistical Manual of Mental Illnesses (DSM)-5 states that to meet criteria for DID a person must experience identity disruption with two or more distinct personality states, with related alterations in the sense of self that create discrepancies in affect, behaviour, memory, perception, consciousness, cognition, or sensory motor functioning (American Psychiatric Association, 2013). Also required for a DID diagnosis is the inability to recall information both of an everyday and traumatic nature (i.e., the so-called amnesia criteria), experiencing distress as a result of the symptoms, and ensuring the symptoms cannot be explained by cultural or religious practices, substance use or a medical condition (American Psychiatric Association, 2013).

Link between Childhood Abuse and Dissociation

The relationship between dissociation and childhood trauma is well established (see Dalenberg et al., 2012). This relationship is so well understood that the DSM-5 explicitly mentions in its description of the dissociative disorders that they are often experienced

following trauma and emphasises the association between these disorders and the trauma disorders (American Psychiatric Association, 2013). Research has often focused on the trauma histories of those people diagnosed with DID and also the trauma histories of people either with no psychiatric diagnoses or general psychiatric diagnoses looking for the presence of dissociation as a psychological process.

For example, Carlson et al. (2001) found that dissociation was significantly positively correlated with neglect, caretaker dysfunction, violent sexual abuse, violent physical abuse, other sexual abuse, and other physical abuse, and negatively related to social support as a child. The highest correlations were with violent sexual abuse and other sexual abuse (Carlson et al., 2001).

Chu and Dill (1990) investigated rates of trauma and dissociation in female inpatients. Physical or sexual abuse was reported by 63% of the group. Childhood trauma was related to higher levels of dissociation in the group, the highest dissociation levels were present for those people who had experienced both physical and sexual abuse (Chu & Dill, 1990). It was also of note that the dissociation scores were higher for people who had been physically abused by a family member than those that had been physically abused by a non-family member, this relationship also held true for sexual abuse, with higher levels of dissociation among those who reported sexual abuse from family members than those who reported sexual abuse from non-family members (Chu & Dill, 1990). Mercado, Martinez-Taboas and Pedrosa (2008) found significant correlations between dissociation and severity of childhood sexual abuse.

In Middleton and Butler's (1998) clinical series of over 60 participants with DID, 87% reported sexual abuse during childhoods and no-one in the sample came from a non-abusive family. Lewis et al. (1997) corroborated the abuse and torture with reports from other people and official documentation in 11 of the 12 male DID cases in a prison population.

Justo, Risso, Moskowitz and Gonzalez (2018) separated their clinical sample of people with schizophrenia into two groups based on their level of dissociation. They found that the high dissociation group had a significantly higher number of traumas than those in the low dissociation group (Justo et al., 2018).

The above research reinforces that childhood trauma correlates with dissociation. The next section explores whether dissociation is related to auditory hallucinations.

Link between Dissociation and Auditory Hallucinations

Pilton et al. (2015) conducted a review and meta-analysis of studies investigating dissociations and auditory hallucinations. They found a moderate effect for the total sample, $r = .51$, and similar sized effects in both non-clinical and clinical studies. When they broke dissociation into types, all types had a significant relationship with auditory hallucinations; depersonalisation, $r = .56$, absorption $r = .54$, dissociative amnesia $r = .46$ and pathological dissociation $r = .40$ (Pilton et al., 2015).

Research in this area focuses on people with psychosis, people with PTSD, people with DID and non-clinical studies. Pilton et al. (2015) reviewed 12 studies that investigated the link between dissociation and auditory hallucinations in people with psychosis, all 12 studies found a significant association between dissociation and voice hearing.

Perona-Garcelan et al. (2008) compared dissociation scores between four groups; non-clinical controls, people with psychosis who never experienced hallucinations, people with psychosis who no longer experience hallucinations, and people with psychosis who currently experience hallucinations. They found significantly higher levels of dissociation in the group of people who currently experience hallucinations than people who had never experienced hallucinations or the non-clinical controls. Perona-Garcelan et al. (2010) confirmed this when they found that those people who have high scores on the hallucination scale were more likely to also experience dissociation at a pathological level.

Varese, Udachina, Myin-Germeys, Oorschor, and Bentall (2011) conducted an Experience Sampling Method study involving 42 people with a schizophrenia diagnosis and 23 non-clinical controls completing a diary for six days. They found higher levels of dissociation in those people that experienced hallucinations over the course of the six days than both the non-clinical controls and those people with schizophrenia who did not experience hallucinations in this time frame. In addition, they found that hallucinating was predicted by dissociation even when paranoia was accounted for. In this study those people who experienced hallucinations were likely to experience more dissociation as a result of low grade stress than those that did not hallucinate (Varese et al., 2011). This indicates that people who hallucinate may be more sensitive to low grade stress than people who do not hallucinate. It also reinforces that for people who hallucinate a common response to stress is dissociation (Varese et al., 2011).

The research looking at people with a PTSD diagnosis compared to people with a psychosis diagnosis is more limited, with Pilton et al. (2015) only have three studies to review. However all three had a significant association between auditory hallucinations and dissociation. For example, Anketell et al. (2010) found that people who experience auditory hallucinations had significantly higher dissociation scores on the DES and DES-T than those who did not hear auditory hallucinations.

There has also been research conducted investigating the relationship between auditory hallucinations and dissociation in people with a diagnosis of DID. Dorahy et al. (2009) investigated 65 participants that were place into three groups based on clinical diagnosis and trauma history; schizophrenia with childhood trauma, schizophrenia without childhood trauma and DID. They found that the DID group were more likely to hear two or more voices, begin hearing voices prior to age 18, and hear both child and adult voices than either of the schizophrenia groups. The DID group also experienced other hallucinations at a

higher rate than the schizophrenia groups. Command hallucinations were heard at a similar level in the DID and schizophrenia with trauma groups compared to the schizophrenia without trauma group who were less likely to hear them. This research supports a strong link between dissociation and auditory hallucinations, given the heightened dissociative symptoms in DID. Laddis and Dell (2012) found similar themes when they compared auditory hallucinations between people with schizophrenia and people with DID. They found higher rates of auditory hallucinations in people with DID than schizophrenia, higher rates of hearing child voices in people with DID, higher rates of experiencing voices arguing or commenting (Laddis & Dell, 2012).

Pilton et al. (2015) reviewed 12 studies that used non-clinical samples to test a relationship between auditory hallucinations and dissociation. Altman (1997) found that when looking at the correlates of auditory hallucinations in an adolescent population the strongest relationship was that between auditory hallucinations and dissociation. Glicksohn and Barrett (2003) found a strong relationship between absorption as a specific facet of dissociation and auditory hallucinations. Kilcommons et al. (2008) also found a strong correlation between dissociation and auditory hallucinations.

Escudero-Perez et al. (2016) investigated the relationship between dissociation and specific facets of auditory hallucinations. They found significant positive correlations between absorption and the distress caused by the hallucinations and between depersonalisation and the severity of the hallucinations (Escudero-Perez et al., 2016). In their analysis the variable most able to predict the severity of auditory hallucinations was depersonalisation (Escudero-Perez et al., 2016).

Links between Childhood Abuse, Auditory Hallucinations and Dissociation

The previous sections have reviewed the research investigating the relationships between pairs of variables. This section reviews the literature that examines all three

variables of interest; childhood trauma, dissociation and auditory hallucinations and how they interplay.

Berry, Fleming, Wong, and Bucci (2018) used a non-clinical sample of 123 university staff and students to investigate the relationships between childhood trauma, dissociation, attachment and hallucinations proneness. They found that when childhood trauma, dissociation, attachment style, age, and negative affect were entered into a multiple regression to predict hallucination proneness the only significant predictors were dissociation and avoidant attachment (Berry et al., 2018).

Bortolon, Seille, and Raffard (2017) also used a non-clinical sample of 425 people to investigate the relationship between childhood trauma, dissociation, schemas and auditory hallucination proneness. Bortolon et al. (2017) used structural equation modelling to elucidate these relationships. They found that physical abuse had a direct relationship with dissociation whereas both sexual and emotional abuse had an indirect relationship through schema (subjugation and vulnerability) to dissociation. They found that dissociation had a direct relationship with auditory hallucination proneness. In addition, in emotional abuse there was an additional pathway to abandonment schema that went directly to auditory hallucination proneness without going through dissociation (Bortolon et al., 2017).

Kilcommons and Morrison (2005) explored trauma and dissociation in people with a psychotic disorder. They found that levels of both trauma and dissociation were associated with hallucinations. When accounting statistically for the impact of trauma on hallucinations, dissociation remained a significant predictor of hallucinations.

Perona-Garcelan et al. (2010) also used a sample of people with a psychotic disorder and measured trauma, dissociation and hallucinations. They found that people who experience hallucinations had higher rate of childhood trauma than those who do not experience hallucinations, this difference was not found for trauma occurring in adulthood.

They then split the participants into two groups; one reporting dissociation at a pathological level and one reporting low dissociation. The pathological dissociation group had significantly higher levels of childhood trauma and hallucinations than the lower dissociation group (Perona-Garcelan et al., 2010).

Wearne et al. (2017) interviewed people who experience hallucinations from across three diagnostic groups; borderline personality disorder, schizophrenia, and post-traumatic stress disorder. Cluster analysis found two distinct clusters. The groups were distinguished by trauma history, level of hallucinations, and depersonalisation, but not diagnosis. They posited that dissociation could be a mediating factor based on the high level of dissociation in those with intrusive hallucinations (Wearne et al., 2017).

However, Laddis and Dell (2012) found that dissociation was not correlated with trauma in their schizophrenia sample. They questioned whether a Type II error had occurred but also questioned whether dissociation in schizophrenia actually reflected a different type of experience than dissociation observed in dissociative disorders. This suggestion was challenged by Moskowitz (2012) who questioned whether dissociation was categorically different in schizophrenia compared with DID or whether it was different in level.

Moskowitz and Corstens (2007) completed a thorough review of the literature around auditory hallucinations and dissociation and concluded that auditory hallucinations must be considered to be a dissociative process. Longden et al. (2012) also completed a comprehensive review of the research involving childhood trauma, dissociation, and auditory hallucinations. They proposed a twofold model of understanding voice hearing either beginning with adversity or beginning with characteristics of the individual. Of relevance here is the adversity track, which has at its genesis experience of trauma or stress, this then leads into dissociation, then the dissociation leads to voice hearing (Longden et al., 2012). Dorahy and Palmer (2015) posit that structural dissociation is an important part of

understanding how auditory hallucinations are developed in people with a chronic trauma disorder and suggest further research to elucidate this relationship.

Following this body of work, researchers have begun to test a mediation model in an attempt to understand the relationship between childhood trauma, dissociation, and auditory hallucinations.

Studies testing a mediation model**.**

There have been several studies that have assessed whether dissociation is a mediator of the relationship between childhood trauma and auditory hallucinations. Perona-Garcelan et al. (2012a) investigated the possible mediation model using a clinical sample of 141 people with either paranoid schizophrenia, psychosis, delusional disorder, or schizoaffective disorder. They assessed trauma using the Trauma Questionnaire (TQ; Davidson, Hughes, & Blazer, 1990), psychosis using the Positive and Negative Symptom Scale (PANSS; Kay, Opler, & Lindenmayer, 1988) and dissociation using the Dissociative Experiences Scale (DES; Carlson & Putnam, 1993). They found that trauma and dissociation were positively correlated when dissociation was taken as a total score (r = .41), and when split into the three subscales of the DES; dissociative amnesia (r = .25), absorption (r = .34) and depersonalisation (r = .37) (Perona-Garcelan et al., 2012a). They also found that trauma was positively correlated with both hallucinations (r = .36) and delusions (r = .32). When a mediation model was applied with the total dissociation score as the mediating variable, the direct effect between trauma and hallucinations became non-significant (Perona-Garcelan et al., 2012a). However, when the same model was applied to delusions the direct effect between trauma and delusions remained significant (Perona-Garcelan et al., 2012a). This indicated that dissociation was a mediator between trauma and hallucinations but not a mediator between trauma and delusions. Once the total dissociation score had been established as a mediator the three subscales; absorption, depersonalisation, and amnesia

were each trialled as possible mediators. They found that only depersonalisation was a significant mediator for the relationship between trauma and hallucinations (Perona-Garcelan et al., 2012a). Based on their results Perona-Garcelan et al. (2012a) posited that memories and internal thoughts are interpreted as external by the person and that dissociation facilitates the process of uncomfortable internal experiences being perceived as dystonic and experienced as voices.

Varese et al. (2012) also investigated this mediation model. They used both a clinical sample of 45 participants with a diagnosis of schizoaffective disorder, schizophrenia, or delusional disorder in addition to a non-clinical control group of 20 people. They assessed for positive and negative symptoms of schizophrenia with the PANSS (Kay et al., 1988), hallucination proneness with the revised Launay-Slade Hallucination Scale (LSHS-R; Bentall and Slade, 1985), childhood trauma with the Child Abuse and Trauma Scale (CATS; Sanders & Becker-Launsen, 1995), dissociation with the DES, verbal intelligence with the Ammons Quick Test (QT; Ammons & Ammons, 1962) and used an auditory signal detection task to assess reality discrimination, which is the ability to correctly distinguish whether cognitive events are generated internally or externally. Their results showed that the relationship between trauma and auditory hallucinations was mediated by dissociation. This mediation relationship was evident when the clinical and non-clinical groups were combined and when the clinical sample was investigated independently (Varese et al., 2012). When the data was separated into specific types of abuse it showed that sexual abuse was the only abuse type that was mediated by dissociation in both the combined and patient only groups (Varese et al., 2012). The combined group showed mediation by dissociation in the relationship between both emotional abuse and neglect, and auditory hallucinations, although these mediations were not significant in the exclusively clinical sample (Varese et al., 2012). This study also found that reality discrimination was not significantly different as a function of dissociation.

However, reality discrimination was significantly different between those that had current or historic hallucinations and people without a history of hallucinations. Those with hallucinations either current or in remission had a higher response bias (Varese et al., 2012). These findings led Varese et al. (2012) to suggest a model with two separate factors. The first being impaired reality discrimination as an already existing risk factor for psychosis and the second being dissociation that is the trigger for the experience of hallucinations to begin (Varese et al., 2012).

Another exploration of the mediation model was conducted by Cole, Newman-Taylor, and Kennedy (2016) who used a non-clinical sample of 200 college students. They assessed for trauma using the CATS, proneness to hallucinations using the LSHS-R, dissociation using the DES, depersonalisation using the Cambridge Depersonalization Scale (CDS; Sierra & Berrios, 2000), and delusions using the Peters et al. Delusions Inventory (PDI; Peters, Joseph, Day, & Garety, 2004). They found that the relationships between trauma, and both hallucination proneness and delusions were mediated by dissociation (Cole et al., 2016). The dissociation scale was then divided into its subscales to ascertain which, if any, of them were specific mediators. Neither dissociative amnesia nor depersonalisation as measured by the DES and the CDS, were mediators of the relationship between trauma and hallucination proneness (Cole et al., 2016). Absorption however, was a significant mediator of this relationship. When the same mediator variables were tested on the relationship between trauma and delusions absorption was again a significant mediator and dissociative amnesia was a negative mediator, depersonalisation was not a mediator in this model (Cole et al., 2016). This study is thought to add weight to the theory that dissociation associated with trauma interferes with information processing and how memory is encoded, this interference can result in traumatic memories not being part of autobiographical memory. Instead, the

traumatic memories are experienced as external intrusions and these intrusions are what are experienced as hallucinations (Cole et al., 2016).

Perona-Garcelan et al. (2014) used a non-clinical sample to investigate the relationship between dissociation, trauma and hallucination proneness. As a part of their study they also wanted to look at mindfulness as a variable to see how it related to dissociation (Perona-Garcelan et al., 2014). Their sample was 318 university students without a psychiatric history. They assessed hallucinations using the LSHS-R, absorption using the Tellegen Absorption Scale (TAS; Tellegen & Atkinson, 1974), depersonalisation using the CDS, mindfulness using the Southampton Mindfulness Questionnaire (Chadwick et al., 2008) and trauma using the TQ (Perona-Garcelan et al., 2014). To compare those with high hallucination proneness from those with low hallucination proneness they split the participants into two groups based on their scores on the LSHS-R. The participants who had scores greater than a standard deviation from the mean on the LSHS-R and made them the high hallucinations group and took the participants who had scores lower than one standard deviation below the mean and made them the low hallucinations group (Perona-Garcelan et al., 2014). When comparing those two groups they found that those in the high hallucinations group were more likely to report childhood trauma than those in the low hallucinations group (Perona-Garcelan et al., 2014). Mindfulness was found to be negatively correlated with both depersonalisation (r = -.28) and absorption (r = -.23) and was not found to have a significant correlation with childhood trauma (Perona-Garcelan et al., 2014). Childhood trauma was positively correlated with both absorption (r = .18) and with depersonalisation (r = .14). Three possible variables were entered into the model as mediators for the relationship between childhood trauma and hallucination proneness; mindfulness, depersonalisation, and absorption (Perona-Garcelan et al., 2014). Mindfulness was not a mediator of the relationship, however both absorption and depersonalisation were significant mediators.

Those two variables together explained 51.38% of the total relationship between childhood trauma and hallucination proneness. Perona-Garcelan et al. (2014) argued that this study lends more credence to the theory that hallucinations are dissociative in nature.

Yamasaki et al. (2016) investigated whether the relationship between peer victimisation and hallucinations was mediated by dissociation. They used 4277 pairs of older children and one of their parents recruited in Tokyo, Japan. The children were around the age of ten (mean age = 9.8 years) and 53% were male. The participants were assessed on both hallucinations and dissociation by parent report on the Child Behaviour Checklist (CBCL; Achenbach, 1991) and peer victimisation using a scale taken from the Olweus Bully/Victims Questionnaire (Solberg & Olweus, 2013). They found that children who experienced hallucinations were more likely to have experienced peer victimisation than those that did not experience hallucinations. The found that dissociation had a significant mediation effect on the relationship between peer victimisation and hallucinatory experiences (Yamasaki et al., 2016). They theorised that the underlying mechanism linking these factors may be HPA axis dysfunction and cognitive dysfunction (Yamasaki et al., 2016).

Pearce et al. (2017) investigated the role of both dissociation and attachment style as possible mediators between childhood trauma and auditory hallucinations. They used a sample of 112 people who identified as having a diagnosis of a psychotic disorder and/or identified as having sought treatment for a psychotic disorder (Pearce et al., 2017). The participants responded to an online survey, the mean age of the sample was 40.26 years and the sample was predominantly female (72%). The participants were assessed on childhood trauma using the Brief Betrayal Trauma Survey (Goldberg & Freyd, 2006), on dissociation using the Dissociative Experiences Scale-Revised (DES-R; Dalenberg & Carlson, 2010). They were assessed for psychotic symptoms including auditory hallucinations using the Community Assessment of Psychotic Experiences (Stefanis et al., 2002) and on attachment

style using the Relationship Questionnaire (RQ; Bartholomew & Horowitz, 1991). Pearce et al. (2017) found that dissociation was positively correlated with fearful attachment, voices, paranoia and childhood trauma. They tested both dissociation and fearful attachment as mediators of the relationship between childhood trauma and auditory hallucinations and found that dissociation was a mediator, but fearful attachment was not (Pearse et al. 2017). When the same mediators were tested on the relationship between childhood trauma and paranoia both dissociation and fearful attachments were mediators (Pearse et al., 2017). This study was said to have added to the literature demonstrating dissociation as a mediator between childhood trauma and voices and that fearful attachment does not appear to be a mechanism in this relationship.

These studies used either a non-clinical sample or a clinical sample of people with a psychotic disorder. There have been no studies which tested the mediation model and used a DID group. These studies show that dissociation is a mediator between childhood trauma and auditory hallucinations. They indicate that when dissociation is broken down into the three subscales of the DES that depersonalisation is the most consistent mediator and some studies indicate that absorption is also a mediator.

Non-auditory hallucinations

While auditory hallucinations and their relationship to trauma and dissociation have been well researched, the other types of hallucinations have not been so closely investigated (Longden, House, & Waterman, 2016). Perhaps this is due to the lower prevalence of visual, olfactory, tactile, and gustatory in comparison to auditory hallucinations. Although, it is worth noting that non-auditory hallucinations are not an unlikely experience for someone with a psychotic disorder and when they are present do contribute to the distress experienced. Some attention has been paid to visual hallucinations as they tend to be the most common

non-auditory hallucination with rates between 24% and 80% in samples of people with psychotic disorders (Longden et al., 2016).

The relationship between visual hallucinations and dissociation has been investigated in non-clinical samples. Yoshizumi et al. (2004) found that children in a non-clinical sample who experienced both auditory and visual hallucinations had higher levels of dissociation and anxiety than those children who experienced either hallucination type independently. However, there is little research using clinical samples at this time.

The research into the relationship between non-auditory hallucinations and childhood trauma has been minimal. However, there are some studies that have found a connection. Read et al. (2003) in addition to their findings on auditory hallucinations found that visual, tactile, and olfactory hallucinations were associated with childhood trauma.

Longden et al. (2016) found that a psychosis group that experienced non-auditory hallucinations had higher dissociation levels and were more likely to have experienced childhood rape than those with psychosis who did not experience non-auditory hallucinations.

These limited studies indicate that there may be a relationship between childhood trauma, non-auditory hallucinations and dissociation, if dissociation is the mediator of this relationship in auditory hallucinations it is worth testing the mediation model with non-auditory hallucinations.

The Present Study

This study looks to add to the research base that indicates dissociation is a mediator of the relationship between childhood abuse and auditory hallucinations. It extends that research base by testing the mediation model in both a schizophrenia group where all participants experience auditory hallucinations and a dissociative identity disorder group. This will enable a comparison to be made between how mediation operates in the different diagnostic groups and in fact whether there is a difference in its operation at all. This comparison will be made

with a total dissociation score as the potential mediator and with the three DES subscales (i.e., amnesia, absorption, & depersonalisation) in addition to DES Taxon as potential mediators.

This study examines what elements of auditory hallucinations are mediated by dissociation beyond presence or absence, this will be done using auditory hallucination frequency and associated distress as dependent variables in the mediation analysis.

This study examined non-auditory hallucinations by including their prevalence and correlations to dissociation and childhood abuse. The mediation model will also be tested with non-auditory hallucinations as the dependent variable to further elucidate how hallucinations in all their modalities can be understood.

Hypotheses

The following hypotheses for this study have been influenced and informed by the relevant research outlined above.

Hypothesis One: There will be higher levels of dissociation and childhood abuse in the DID than the schizophrenia group. Higher levels of dissociation were found in the Laddis and Dell (2012) study and Dorahy et al. (2009) found levels of higher trauma and dissociation in the DID group.

Hypothesis Two: Childhood abuse will be positively correlated with auditory hallucination frequency and associated distress in both the schizophrenia group and the DID group. This is well documented in the research, including Read et al. (2003).

Hypothesis Three: Childhood abuse will be positively correlated with dissociation in both the schizophrenia and the DID group. Dalenberg et al. (2012) support this relationship in their review and meta-analytic work.

Hypothesis Four: Dissociation will be positively correlated with auditory hallucination frequency and associated distress in both the schizophrenia and the DID group. The Pilton et al. (2015) review and meta-analysis demonstrate this strongly.

Hypothesis Five: Dissociation as a total score will be a significant mediator of the relationship between childhood abuse and auditory hallucination frequency and associated distress in both the schizophrenia and the DID group. This is consistent with the findings in previous mediation studies (Cole et al., 2016; Perona-Garcelan et al., 2012a; Perona-Garcelan et al., 2014; Varese et al., 2012; Yamasaki et al., 2016).

Hypothesis Six: When the total dissociation score from the DES is split into its three subscales; amnesia, depersonalisation, and absorption only depersonalisation and absorption will remain significant mediators. This is based on the finding from Perona-Garcelan et al. (2012a) which found depersonalisation as a mediator and on Perona-Garcelan et al. (2014) which found both depersonalisation and absorption to be mediators. This is also based on the finding from Escudero-Perez (2016) who found that depersonalisation was a predictor of severity of auditory hallucinations and absorption was positively correlated with distress.

Hypothesis Seven: When the DES taxon score is used as the mediating variable it will provide the strongest mediation of the relationship between childhood abuse and auditory hallucination frequency and associated distress. This is hypothesised as the DES taxon score is considered to be indicative of structural dissociation and structural dissociation is hypothesised to have a central role in the development of auditory hallucinations (Dorahy & Palmer, 2015).

Hypothesis Eight: Dissociation will be a significant mediator of the relationship between childhood abuse and non-auditory hallucinations in both the schizophrenia and the DID group. This is based on the Longden et al. (2016) study that found increased rates of

dissociation and childhood trauma in those with non-auditory hallucinations than a control group.

Method

Participants

This study used 100 participants recruited from Pathways Health Limited, Workwise Employment Agency, outpatients at Hillmorton Hospital and one private Clinical Psychologist all in Christchurch, New Zealand and from Belmont Private Hospital in Brisbane, Australia. Participants were placed into either the schizophrenia (n=50) or dissociative identity disorder (DID) group (n=50) based on an established psychiatric diagnosis. The schizophrenia group included three participants with a diagnosis of unspecified schizophrenia spectrum disorder and the remainder had a diagnosis of schizophrenia or schizoaffective disorder. Inclusion in the schizophrenia group also required that the participants experienced auditory hallucinations.

The DID group ranged in age from 18 to 70 and the schizophrenia group ranged in age from 21 to 64. Table 1 presents the means and standard deviations. There was no statistically significant difference between the DID and schizophrenia groups on age, F (1,98) = .54, p = .46, η_p^2 = .005.

There was a significant difference between the DID and Schizophrenia groups on gender with women being more highly represented in the DID group, χ^2 (1, n=100) = 34.08, p <.001 (see Table 1).

With employment status there were several responses that were endorsed by less than five participants so inferential statistics were not able to be used. However, the DID group had more people working than the schizophrenia group and the schizophrenia group had more people on the sickness benefit than the DID group (see Table 1).

There was a significant difference between the two groups on marital status, χ^2 (2, n = 100) = 23.19, p <.001, with more singles in the schizophrenia group (see Table 1).

The participants were assessed on the DDIS to verify the likely presence or absence of a DID diagnosis. There were five people in the DID group who did not meet the DID diagnosis criteria on the DDIS this may be due to the effects of treatment on their symptoms. There were seven participants in the schizophrenia group who met the diagnostic criteria for DID on the DDIS. Five of these participants when further clarified did not have experiences consistent with DID. Two of these participants had experiences that may be consistent with DID, however they also had the hallmarks of schizophrenia and were being treated for schizophrenia. There was a significant difference between the two groups on eligibility for a DID diagnosis, χ^2 (1, n=95) = 53.07, p <.001 with more DID diagnoses in the DID group than the schizophrenia group (see Table 1).

Due to an issue with data collection ethnicity data was not collected for the DID group and was only collected for 46 participants in the schizophrenia group (see Table 1).

Medication data was collected for all the schizophrenia participants and for 19 participants in the DID group (see Table 1). A participant who was only taking medications as required was not considered to be taking medications in this analysis as we were measuring regular medication use. There was a significant difference between those taking and not taking medications in the two groups, χ^2 (1, n = 69) = 10.57, p = .001 with more people not taking medications in the DID group than the schizophrenia group.

Table 1

Demographic Data for the DID and Schizophrenia Groups

Demographic	DID	Schizophrenia
Age – Mean (SD)	45.14 (10.90)	43.54 (10.83)
Gender – N (%)		

Male	2 (4%)	29 (58%)
Female	48 (96%)	21 (42%)
Employment		
Full time	7 (14%)	0 (0%)
Part time	11 (22%)	7 (14%)
Unemployed	4 (8%)	0 (0%)
Students	5 (10%)	0 (0%)
Sickness Beneficiary	22 (44%)	40 (80%)
Other	1 (2%)	3 (6%)
Marital Status		
Married/ defacto	16 (32%)	5 (10%)
Separated/divorced	19 (38%)	6 (12%)
Single	15 (30%)	39 (78%)
DDIS		
DID Diagnosis	44 (89.8%)	7 (15.2%)
No DID Diagnosis	5 (10.2%)	39 (84.8%)
Ethnicity		
NZ European		32 (69.6%)
NZ Maori		9 (19.6%)
Samoan		1 (2.2%)
Other		4 (8.7%)
Medication		
Taking medication	12 (63.2%)	47 (94%)
Not taking medication	7 (36.8%)	3 (6%)

Measures

The study used 11 questionnaires in order to ascertain the nature of symptoms, childhood abuse and demographic information.

The demographic questionnaire assessed six demographics; sex, age, employment status, marital status, medications currently used, and ethnicity (Appendix A). However, due to an administration error medication and ethnicity data were not collected for some participants.

The Childhood Trauma Questionnaire (CTQ-SF; Bernstein et al., 2003; Appendix B) is a 28 item self-report questionnaire which assesses five aspects of childhood trauma; emotional abuse, physical abuse, sexual abuse, emotional neglect and, physical neglect (Bernstein et al., 2003). It has good convergent and discriminate validity when compared to therapist ratings of trauma (Bernstein et al., 2003). This scale had good internal consistency in this study for the total score (Cronbach's $\alpha = .96$), which was used to provide the independent variable in all mediation analyses.

The Information about Voices questionnaire (Appendix C) is comprised of 34 questions developed by Dorahy and Middleton to explore the phenomenology of voice hearing. The first question from this questionnaire was used as a dependent measure of frequency of auditory hallucinations in this study (Voices1). It read, "Have you ever heard voices that you suspect that others don't hear or report hearing?" It was rated on a five point scale with one indicating never and five indicating always.

The Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986; Appendix D) is a 28 item self-report questionnaire that asks participants to indicate what percentage of time each experience happens to them from 0% to 100%. This questionnaire has strong test-retest reliability of 0.84 and has good discriminant, construct and criterion validity (Bernstein & Putnam, 1986). Carlson et al. (1991, as cited in Carlson & Putnam, 1993) completed a

factor analysis that yielded three subscales which were used in this study; amnesia, absorption and depersonalisation. Waller et al. (1996) found that an 8 item subscale of the DES (called the DES-T) was able to differentiate between people with pathological dissociation and those with non-pathological dissociation. This study used all four subscales as possible mediators between childhood trauma and auditory hallucinations in the analyses. This scale had excellent internal consistency in this study (Cronbach's $\alpha = .97$). Three of the subscales had excellent internal consistency in this study; DES Taxon (Cronbach's $\alpha = .90$), Amnesia (Cronbach's $\alpha = .92$) and Absorption (Cronbach's $\alpha = .97$). Depersonalisation had good internal consistency in this study (Cronbach's $\alpha = .88$).

The Psychotic Symptom Rating Scale (PSYRATS; Haddock, McCarron, Tarrier, & Faragher, 1999; Appendix E) is a 17 item self-report questionnaire designed to assess both auditory hallucinations and delusions in some depth. There are eleven questions regarding auditory hallucinations and six questions regarding delusions, these questions are answered on a 0-4 point scale with each point having a specific descriptor which changed for each question. The inter-rater reliability for the auditory hallucination items are all over 0.79 and for the delusions items are all over 0.88 (Haddock et al., 1999). Woodward et al. (2014) tested the scale on a sample of 711 people with auditory hallucinations, 520 people with delusions and 325 people with both auditory hallucinations and delusions to look for factors and found six. The factors that they found and the corresponding intraclass correlation coefficients were; hallucination distress ($r = .93$), hallucination frequency ($r = .87$), hallucination attribution ($r = .67$), hallucination loudness (this is a single item so no ICC is available), delusion distress ($r = .93$) and delusion frequency ($r=.87$) (Woodward et al., 2014). In this study the hallucination distress and frequency scales were used as dependent variables in the mediation analyses. This scale had good internal consistency in this study (Cronbach's $\alpha = .84$). Hallucination distress had good internal consistency in this study, Cronbach's $\alpha =$

.80. Hallucination frequency had acceptable internal consistency in this study (Cronbach's α = .71).

The Dissociative Identity Disorder diagnosis module of the Dissociative Disorders Interview Schedule is a four question semi-structured interview that indicates the likely presence or absence of a diagnosis of DID (DDIS; Ross et al., 1989; Appendix F). The questions assess whether the person experiences having more than one distinct personalities, whether these distinct personalities take control of the person's behaviour recurrently, whether the person has memory for traumatic events and whether the personalities are due to a medical condition or substance abuse (Ross et al., 1989). If a person answers yes to the first three questions and no to the last question it is indicative of the presence of DID. This measure was used to assess the presence or absence of DID in each participant in this study.

Four questions from the Mental Health Research Institute Unusual Perceptions Schedule (MUPS; Carter et al., 1995; Appendix G) were used to assess non-auditory hallucination modalities. These four questions assessed the presence and frequency of visual, tactile, gustatory and olfactory hallucinations on a scale from 1 (never) to 5 (always). These measures were used as a dependent variable in some of the mediation analyses. This scale had acceptable internal consistency in this study (Cronbach's α = .73).

Procedure

This study was part of a larger study that received ethics approval from both the University of Canterbury and the Health and Disability Ethics Committee (Ref 2013/40). All interviews were conducted in a laboratory, an office within the hospital, an office within Pathways, one of the Pathways sites or at the participants own home. Invitation letters (Appendix H) detailing the purpose of the study and what participation would involve were distributed to people other than the researcher (e.g. therapist, case manager, community support worker) with access to potential participants. If a potential participant expressed

interest their contact details were given to the researcher. If the person who discussed the research with the participant was not the person's clinical case manager or psychiatrist the researcher made contact with that person and sought their consent to proceed. The researcher made contact with the participant and arranged a meeting. At the beginning of the meeting the researcher went through the information sheet (Appendix I) with the participant which included where they could seek support if they felt that they needed any following on from their participation, this included the phone numbers for Samaritans, Lifeline and Psychiatric Emergency Services. The participant then signed the consent form (Appendix J). The researcher then read out the questions and possible responses for each measure and recorded the stated answer. The measures were in a random order for each interview with the exception of the demographics which was always done first and the CTQ which was placed in the first half of the battery. This was to reduce the saliency of this measure before the participant left the interview. The participant was then verbally debriefed, thanked for their contribution and given a $10 Westfield voucher to acknowledge their time. If they had made their way to the researcher for the interview then they were also given a $10 petrol voucher to reimburse them for their travel costs. This was not given if the researcher had conducted the interview in the participants' home.

Data analysis

All data was entered into IBM SPSS Statistics Version 24 for analysis. Exploratory data analysis was completed and identified outliers. In the DES there were three participants who were outliers. The outlying scores were brought down to the next highest score on that scale. There were two participants with outlying scores in the CTQ Total, these scores were brought down to the next highest score on that scale. The reliability of the scales used was calculated using Cronbach's alpha.

Hypotheses one was tested with a one-way ANOVA. Hypotheses two through four were tested using Pearson correlations. Hypotheses five through seven were tested using Hayes (2013) PROCESS macro for calculating mediation in SPSS. The predictor variable was childhood abuse (CTQ Total), the possible mediating variables were dissociation total, depersonalisation, dissociative amnesia, absorption and DES Taxon, all from the DES and the outcome measures were two measures of auditory hallucination frequency (Voices1 and PSTRATS Frequency) and the distress associated with auditory hallucinations (PSYRATS Distress). For the non-auditory hallucinations, the outcome measures were visual, tactile, olfactory and gustatory hallucinations (as measured in the MUPS). For mediation to occur the predictor variable must be related to the mediator and the mediator must be related to the outcome variable (Hayes, 2017). However, it is not required that the total effect (effect of x on y before the mediator is added to the model) is significant for mediation to be tested, "mediation analysis as practiced now no longer imposes evidence of simple association between X and Y as a precondition" (Hayes, 2017, p. 80). The indirect effect was tested with Preacher and Hayes (2004) method with a 5,000 bootstrapping sample to give 95% confidence intervals. If the indirect confidence interval does not include zero, then mediation can be said to have occurred.

Results

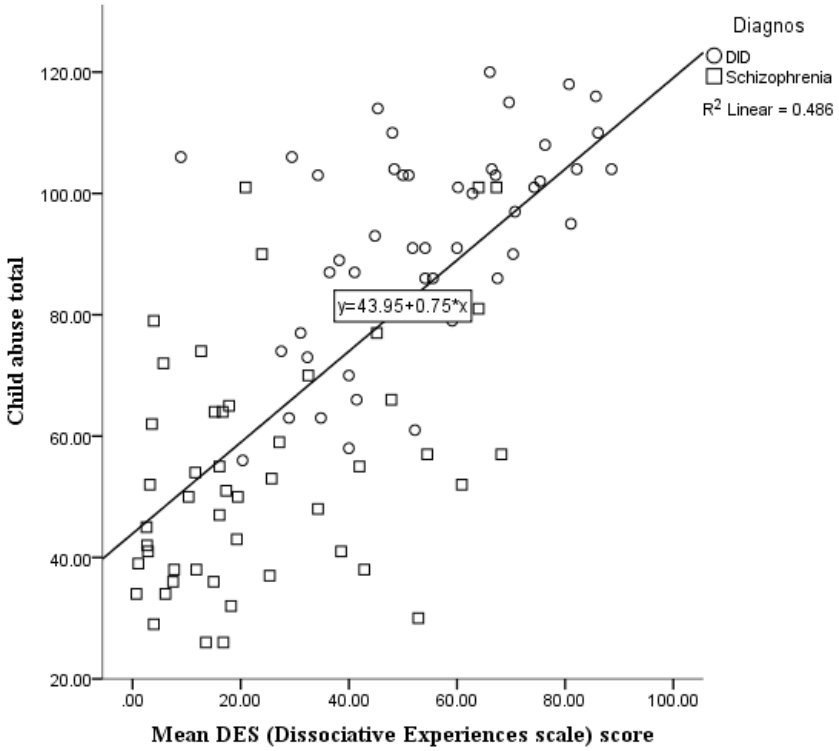
Diagnostic Group Differences

The DID group had significantly higher levels of childhood abuse than the schizophrenia group, F (1,92) = 103.01, $p < .001$. They also had significantly higher levels of dissociation than the schizophrenia group, F (1,98) = 56.62, $p < 0.001$. When the scores on these two variables were plotted in a scatter plot the schizophrenia group were clustered in the bottom left quadrant and the DID group were clustered in the top right quadrant (see Figure 1). This gives the illusion of a linear relationship between the variables of abuse and

dissociation, which is actually created by the group differences. Due to these group differences all further analyses were run separately for each diagnostic group so that artificial results were not generated.

Figure 1

Scatterplot of scores on Childhood Abuse and Dissociation by Diagnosis



Is the relationship between childhood abuse and auditory hallucinations mediated by dissociation?

DID group. To evaluate whether mediation has occurred the first step was to examine the univariate relationships between the variables of interest. In this case the predictor variable was childhood abuse (CTQ Total), the possible mediators were total dissociation (DES Total), depersonalisation, dissociative amnesia, absorption and DES Taxon and the outcome variables were two measures of auditory hallucination frequency (Voices1 and Frequency) and distress associated with auditory hallucinations.

As can be seen in Table 2 childhood abuse was not significantly correlated with any of the measures of auditory hallucination frequency or distress. However, childhood abuse was positively correlated with all dissociation metrics.

Total dissociation was positively correlated with Voices1 and with distress, but not with Frequency. When the total dissociation score was split into its subscales both depersonalisation and the taxon were positively correlated with all three measures of auditory hallucinations (i.e. frequency & distress). Conversely, absorption was not correlated with any of the auditory hallucination measures and amnesia was only positively correlated with Voices1.

Table 2

Correlations between Childhood Abuse, Auditory Hallucinations and Dissociation - DID Group

	1	2	3	4	5	6	7	8	9
1. Voices1	--								
2. Distress	.45**	--							
3. Frequency	.59**	.57**	--						
4. CTQ Total	.25	.05	.07	--					
5. DES Total	.40**	.30*	.22	.54**	--				
6. Depersonalisation	.41*	.34*	.29*	.48**	.86**	--			
7. Absorption	.28	.21	.17	.37*	.87**	.69**	--		
8. Amnesia	.37*	.23	.16	.55**	.85**	.65**	.55*	--	
9. DES Taxon	.43**	.30*	31*	.52**	.92**	.90**	.68**	.87**	--

Note: *p<.05, **p<.01, two tailed. N = 45-48.

The PROCESS macro for SPSS was used to run the mediation analyses. Mediation analyses were run for relationships where there was both a significant relationship between the predictor variable and the potential mediator, and a significant relationship between the

potential mediator and the outcome variable. Mediation was considered to have occurred if the 95% confidence interval for the indirect effect after bootstrapping with a 5,000 sample does not include zero. In addition, there needs to be a significant relationship between the predictor and mediator (*a*) and between the mediator and the outcome (*b*).

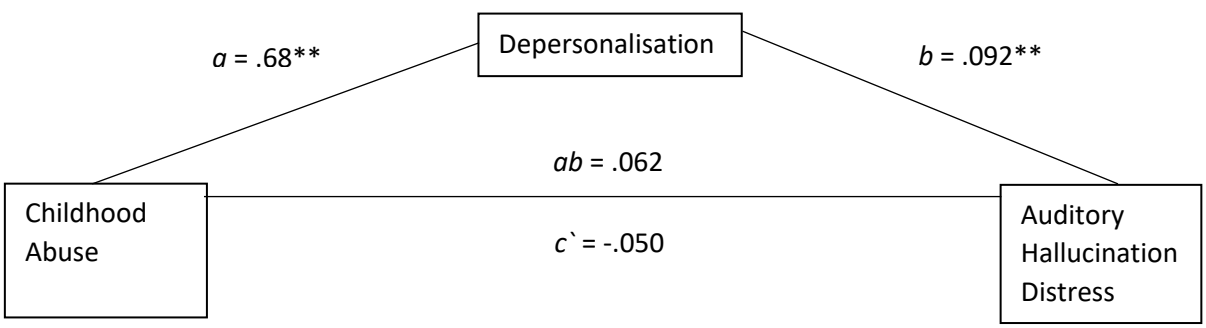
Dissociation total was assessed as a mediator of both the relationship between childhood abuse and Voices1 and the relationship between childhood abuse and distress associated with auditory hallucinations. As can be seen in Table 3 neither of these relationships were mediated by dissociation total as in both cases the indirect effect contained zero.

Dissociative amnesia was tested as a potential mediator of the relationship between childhood abuse and Voices1 but it did not mediate this relationship (see Table 3).

Depersonalisation was tested as a mediator of the relationships between childhood abuse and all three measures of auditory hallucination frequency and associated distress. Depersonalisation was not a mediator for either measure of auditory hallucination frequency. However, it was a mediator for the relationship between childhood abuse and distress associated with auditory hallucinations (see Figure 2).

Figure 2

Relationship between childhood abuse and auditory hallucination distress mediated by depersonalisation in people with DID.



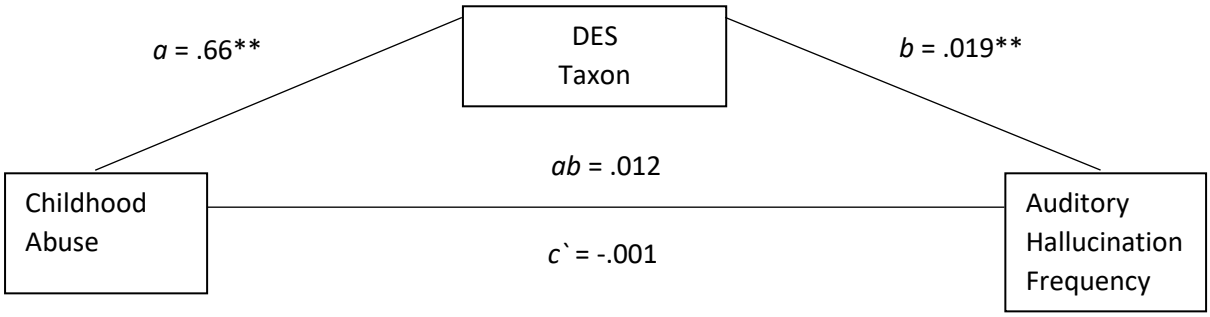
Note: Simple mediation model with unstandardized *B* reported. The relationship between childhood abuse and depersonalisation is represented by *a*, the relationship between depersonalisation and the distress associated with auditory hallucinations is represented by *b*, the indirect effect is represented by *ab* and the direct effect is represented by *c`*. *p<.05, **p<.01.

This mediation model suggests that in the DID group higher levels of childhood abuse increase the likelihood of experiencing depersonalisation and that higher levels of depersonalisation increase of likelihood of experiencing distress associated with the experience of auditory hallucinations.

DES Taxon was entered as a potential mediator of the relationships between childhood abuse and all three measures of auditory hallucination frequency and associated distress. As can be seen in Table 3 DES Taxon was only a mediator of the relationship between childhood abuse and one measure of frequency of auditory hallucinations (Voices1), this is illustrated in Figure 3.

Figure 3

Relationship between childhood abuse and auditory hallucination frequency (Voices1) mediated by DES Taxon in the DID Group.



Note: Simple mediation model with unstandardized *B* reported. The relationship between childhood abuse and DES Taxon is represented by *a*, the relationship between DES Taxon and auditory hallucination frequency (measured by Voices1) is represented by *b*, the indirect effect is represented by *ab* and the direct effect is represented by *c`*. *p<.05, **p<.01.

This model suggests that people with DID who have higher levels of childhood abuse are more likely to experience higher levels of DES Taxon. People with DID who have higher levels of DES Taxon are more likely to have a higher frequency of auditory hallucinations as measured by the item, "Have you ever heard voices that you suspect that others don't hear or report hearing?" Childhood abuse was not shown to have a direct relationship with frequency of auditory hallucinations once DES Taxon was accounted for.

An additional analysis was completed to test the same mediation model with the single frequency question from the PSYRATS, "How often are the voices present?" (PSYRATS A1) as the dependent variable. Mediation did not occur with PSYRATS A1 as the dependent variable as the indirect effect with 95% confidence intervals included zero (see Appendix K for the statistics).

It is worth noting that in the DID group Voices1 and Frequency have a moderate correlation, $r = .59$, $p < .001$, in addition Voices and PSYRATS A1 also have a moderate correlation, $r = .60$, $p < .001$.

Table 3

Simple Mediation results for the DID group.

Y	M	*a*	*b*	*c'*	*ab*	CI 95%
Voices1	DES Total	.61**	.019*	.002	.012	-.003 - .022
Distress	DES Total	.61**	.10*	-.049	.062	-.012 - .123
Voices1	Amnesia	.78**	.013*	.003	-.010	-.003 - .022
Voices1	Depersonalisation	.68**	.015*	.003	.010	-.0001- .020
Frequency	Depersonalisation	.70**	.041	-.017	.029	-.011 - .065
Distress1	Depersonalisation	.68**	.092**	-.050	.062	.006 - .125
Voices1	Taxon	.66**	.019**	.001	.012	.002 - 023
Distress	Taxon	.66**	.088*	-.046	.058	-.006 - .127
Frequency	Taxon	.70**	.052*	-.024	.036	-.016 - .076

Note: Simple mediation model with unstandardized *B* reported. The relationship between childhood abuse and the mediator (M) is represented by *a*, the relationship between the mediator and the dependent variable (Y) is represented by *b*, the indirect effect is represented by *ab*, the direct effect is represented by *c`* and CI 95% is the confidence interval. *p<.05, **p<.01.

Schizophrenia group. The same statistical process was completed for the schizophrenia group to investigate the relationships between the variables of interest.

As shown in Table 4 childhood abuse was not significantly correlated with any of the measures of auditory hallucination frequency or associated distress in the schizophrenia group. However, there was a significant correlation between childhood abuse and all measures of dissociation.

Total dissociation was not correlated with any of the measures of auditory hallucination frequency or distress. However, when dissociation was split into its subscales one of the frequency measures (Voices1) was significantly correlated with both depersonalisation and DES Taxon.

Table 4

Correlations between Childhood Abuse, Dissociation and Auditory Hallucinations – Schizophrenia Group

	1	2	3	4	5	6	7	8	9
1. Voices1	--								
2. Distress	.26	--							
3. Frequency	.46**	.60**	--						
4. CTQ Total	-.09	.27	-.02	--					
5. DES Total	.26	.17	.10	.40**	--				
6. Depersonalisation	.36*	.18	.13	.35*	.91**	--			
7. Absorption	.23	.20	.10	.40**	.97**	.84**	--		
8. Amnesia	.16	.14	.07	.32*	.93**	.79**	.89**	--	

9. DES Taxon	.35*	.16	.10	.31*	.95**	.93**	.91**	.89**	--

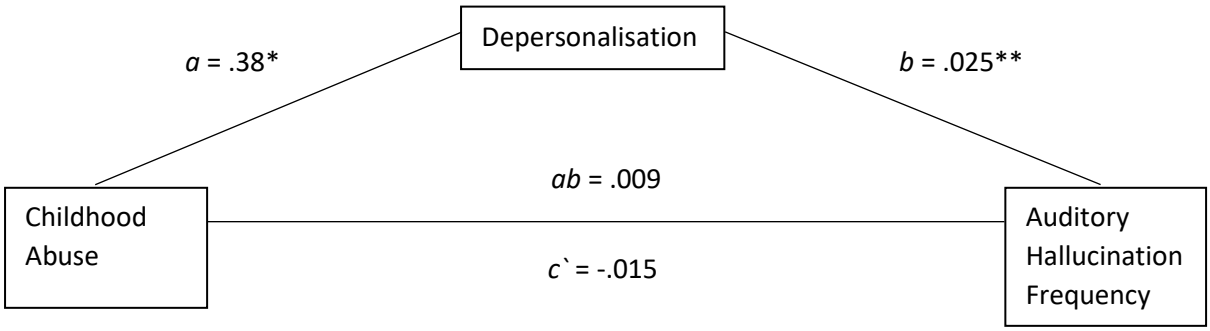
Note: *p<.05, **p<.01, two tailed. N = 48 – 50.

Using the mediation criteria detailed above only two possible models were able to be tested for the schizophrenia group; the relationship between childhood abuse and Voices1 with both depersonalisation and DES Taxon as potential mediators.

As can be seen in Table 5 the relationship between childhood abuse and Voices1 was mediated by depersonalisation, the mediation relationship is detailed in Figure 4. However, DES Taxon was not a mediator of this same relationship (see Table 5).

Figure 4

Relationship between childhood abuse and auditory hallucination frequency (Voices1) mediated by depersonalisation in the Schizophrenia group.



Note: Simple mediation model with unstandardized *B* reported. The relationship between childhood abuse and depersonalisation is represented by *a*, the relationship between depersonalisation and auditory hallucination frequency (measured by Voices1) is represented by *b*, the indirect effect is represented by *ab* and the direct effect is represented by *c`*. *p<.05, **p<.01.

This mediation model suggests that for people with schizophrenia higher levels of childhood abuse increase the likelihood of experiencing higher levels of depersonalisation and that higher levels of depersonalisation increase the frequency of auditory hallucinations.

An additional analysis was completed to test the same mediation model with the single frequency question from the PSYRATS, “How often are the voices present?” (PSYRATS A1) as the dependent variable. Mediation did not occur with PSYRATS A1 as

the dependent variable as the indirect effect with 95% confidence intervals included zero and the relationship between depersonalisation and the PSYRATS A1 was not significant (see Appendix K for the statistics).

It is worth noting that in the Schizophrenia group Voices1 and Frequency have a moderate correlation, $r = .46$, $p = .001$, in addition Voices and PSYRATS A1 also have a moderate correlation, $r = .39$, $p = .006$.

Table 5

Simple Mediation results for the Schizophrenia group.

Y	M	*a*	*b*	*c'*	*ab*	CI 95%
Voices1	Depersonalisation	.38*	.025**	-.015	.009	.001-.019
Voices1	Taxon	.30*	.027**	.014	.008	-.0001-.0194

Note: Simple mediation model with unstandardized *B* reported. The relationship between childhood abuse and the mediator (M) is represented by *a*, the relationship between the mediator and the dependent variable (Y) is represented by *b*, the indirect effect is represented by *ab*, the direct effect is represented by *c`* and CI 95% is the confidence interval. *$p<.05$, **$p<.01$.

In summary, the relationship between childhood abuse and auditory hallucination frequency was mediated by DES Taxon in the DID group. This same relationship was mediated instead by depersonalisation in the schizophrenia group. The relationship between childhood abuse and distress associated with auditory hallucinations was mediated by depersonalisation in the DID group. This mediation was not able to be assessed in the schizophrenia group as there was not a significant relationship between distress and dissociation.

Frequency of non-auditory hallucinations

As can be seen in Table 6 the most common non-auditory hallucination for the DID group was tactile while the most common for the schizophrenia group was visual. The least common non-auditory hallucination for both DID and schizophrenia was gustatory.

Table 6

Frequency of Non-Auditory hallucinations in the DID and Schizophrenia Groups as assessed by the MUPS.

		Visual	Tactile	Olfactory	Gustatory
No (Never)					
	DID	14 (28%)	11 (22%)	13 (26%)	19 (38%)
	Schizophrenia	20 (40%)	26 (52%)	26 (52%)	37 (74%)
Yes					
	DID	36 (72%)	39 (78%)	37 (74%)	31 (62%)
	Schizophrenia	30 (60%)	24 (48%)	24 (48%)	13 (26%)
A few times					
	DID	10 (20%)	7 (14%)	6 (12%)	13 (26%)
	Schizophrenia	8 (16%)	9 (18%)	9 (18%)	4 (8%)
Sometimes					
	DID	16 (32%)	19 (38%)	16 (32%)	15 (30%)
	Schizophrenia	11 (22%)	7 (14%)	7 (14%)	6 (12%)
A lot of times					
	DID	6 (12%)	11 (22%)	9 (18%)	2 (4%)
	Schizophrenia	3 (6%)	4 (8%)	5 (10%)	3 (6%)
Always					
	DID	4 (8%)	2 (4%)	6 (12%)	1 (2%)
	Schizophrenia	8 (16%)	4 (8%)	3 (6%)	0 (0%)

Note: N=50 each for DID and schizophrenia. Any half scores on the Likert scale were rounded down to the next whole number.

Is the relationship between childhood abuse and non-auditory hallucinations mediated by dissociation?

DID group. To test whether the relationships between childhood abuse and non-auditory hallucinations were mediated by dissociation the predictor variable was again childhood abuse and the outcome measures were frequency of visual, tactile, olfactory and gustatory hallucinations.

As shown in Table 7 childhood abuse was positively correlated with olfactory and gustatory hallucinations.

Visual hallucinations were correlated with all dissociation measures except absorption; tactile and olfactory hallucinations were correlated with all measures of dissociation and gustatory hallucinations was correlated with depersonalisation, amnesia DES Taxon.

The relationship between childhood abuse and dissociation was already established above and was significant.

Table 7

Correlations between childhood abuse, dissociation and non-auditory hallucinations in the DID Group

	1	2	3	4	5	6	7	8	9	10
1. Visual	--									
2. Tactile	.53**	--								
3. Olfactory	.60**	.60**	--							
4. Gustatory	.40**	.53**	.46**	--						
5. CTQ Total	.28	.26	.44**	.51**	--					
6. DES Total	.43**	.46**	.51**	.26	.54**	--				
7. Depersonalisation	.52**	.60**	.52**	.37**	.48**	.86**	--			

8. Amnesia	.37**	.40**	.55**	.28*	.55**	.85**	.65**	--		
9. Absorption	.26	.30*	.31*	.05	.37*	.86**	.69**	.55**	--	
10. Taxon	.52**	.53**	.58**	.37**	.52**	.92**	.90**	.87**	.68**	--

Note: *p<.05, **p<.01, two tailed. N = 46-50.

The same criteria as detailed above were used to decide which mediation models would be tested in this group.

As can be seen in Table 8 all of the possible mediators; dissociation total, depersonalisation, amnesia and DES Taxon mediated the relationship between childhood abuse and visual hallucinations. The strongest indirect effect was found when DES Taxon was used as the mediator. This suggests that in people with DID experiencing higher levels of childhood abuse increases the likelihood of DES Taxon, which is associated in turn with greater the increased likelihood of experience of visual hallucinations.

In respect to tactile hallucinations, the relationships between them and childhood abuse was mediated by total dissociation, depersonalisation, amnesia and DES Taxon. The relationship was not mediated by absorption as this mediator was not significantly related to tactile hallucinations in the mediation analyses. Depersonalisation and DES Taxon were the strongest mediators of this relationship.

The relationship between childhood abuse and olfactory hallucinations was mediated by total dissociation, depersonalisation, amnesia and DES taxon. The strongest mediator was DES Taxon which suggests that as childhood abuse increases the DES Taxon scores rise which is turn increases the likelihood of olfactory hallucinations.

No measures of dissociation (depersonalisation, amnesia, absorption or taxon) mediated the relationship between childhood abuse and gustatory hallucinations.

In short, depersonalisation and DES Taxon emerged as the most consistent mediators between childhood abuse and visual, tactile and olfactory hallucinations in the DID group.

Table 8

Simple Mediation results for non-auditory hallucinations in the DID group.

Y	M	*a*	*b*	*c'*	*ab*	CI 95%
Visual	Total	.61**	.025*	.005	.015	.004 - .031
Visual	Depersonalisation	.68**	.025*	.003	.017	.006 - .031
Visual	Amnesia	.77**	.020*	.004	.016	.003 - .036
Visual	Taxon	.66**	.028**	.001	.018	.007 - .036
Tactile	Total	.61**	.027**	.001	.017	.005 - .031
Tactile	Depersonalisation	.68**	.029**	-.002	.020	.009 - .035
Tactile	Amnesia	.77**	.021*	.002	.016	.003 - .036
Tactile	Absorption	.43*	.013	.013	.006	.003 - .013
Tactile	Taxon	.66**	.030**	-.002	.020	.009 - .036
Olfactory	Total	.61**	.032**	.015	.019	.006 - .033
Olfactory	Depersonalisation	.68**	.027**	.016	.018	.007 - .031
Olfactory	Amnesia	.77**	.025**	.015	.020	.004 - .041
Olfactory	Absorption	.43*	.020	.026	.008	-.0008 - .019
Olfactory	Taxon	.66**	.032**	.013	.021	.008 - .038
Gustatory	Depersonalisation	.68**	.008	.025**	.005	-.005 - .015
Gustatory	Amnesia	.77**	-.0006	.031**	-.0005	-.014 - .013
Gustatory	Taxon	.66**	.001	.026**	.004	-.009 - .016

Note: Simple mediation model with unstandardized *B* reported. The relationship between childhood abuse and the mediator (M) is represented by *a*, the relationship between the mediator and the dependent variable (Y) is represented by *b*, the indirect effect is represented by *ab*, the direct effect is represented by *c`* and CI 95% is the confidence interval. N = 46, *p<.05, **p<.01.

Schizophrenia group. The relationship between childhood abuse and dissociation had been previously established.

Table 9 shows the correlations for the schizophrenia group between predictor, mediator and outcome variables. Visual hallucinations were correlated with all possible mediators except for amnesia. Tactile hallucinations were correlated with all possible mediators except for depersonalisation. Olfactory hallucinations were correlated with all possible mediators and gustatory hallucinations were correlated with total dissociation and absorption.

Childhood abuse was not significantly correlated with any of the non-auditory hallucinations (see Table 9).

Table 9

Correlations between childhood abuse, dissociation and non-auditory hallucinations in the Schizophrenia Group

	1	2	3	4	5	6	7	8	9	10
1. Visual	--									
2. Tactile	.29**	--								
3. Olfactory	.47**	.27	--							
4. Gustatory	.13	.19	.34*	--						
5. CTQ Total	.28	-.06	.27	-.10	--					
6. DES Total	.42**	.32*	.41**	.30*	.40**	--				
7. Depersonalisation	.45**	.26	.34*	.24	.35*	.91**	--			
8. Amnesia	.28	.32*	.37*	.26	.32*	.93**	.79**	--		
9. Absorption	.39**	.30*	.43**	.35*	.40**	.97**	.84**	.89**	--	
10. Taxon	.44**	.36**	.43**	.26	.31*	.95**	.93**	.89**	.91**	--

Note: *p<.05, **p<.01, two tailed. N = 48-50.

As shown in Table 10, all the possible mediators for the relationship between childhood abuse and visual hallucinations were mediators for the relationship, the strongest

mediators were total dissociation and depersonalisation. This contrasts with the results in the DID group where DES Taxon was the strongest mediator of this relationship.

With tactile hallucinations only dissociation total mediated the relationship between childhood abuse and tactile hallucinations.

The relationship between childhood abuse and olfactory hallucinations was mediated by dissociation total and absorption, with absorption being the stronger mediator. This suggests that for people with schizophrenia higher levels of childhood abuse increase the likelihood of experiencing higher levels of absorption which is turn increases the likelihood of experiencing olfactory hallucinations.

Dissociation total and absorption mediated the relationship between childhood abuse and gustatory hallucinations. While absorption had a slightly higher indirect effect in that model the direct effect remains significant indicating that only partial mediation had taken place. When dissociation total was the mediator the direct effect was non-significant indicating mediation had taken place.

Table 10

Simple Mediation results for non-auditory hallucinations in the Schizophrenia group

Y	M	*a*	*b*	*c'*	*ab*	CI 95%
Visual	Total	.40**	.027*	.010	.011	.001 - .027
Visual	Depersonalisation	.38*	.029**	.011	.011	.001 - .023
Visual	Absorption	.50**	.020*	.011	.010	.0004 - .025
Visual	Taxon	.30*	.032**	.012	.009	.0001 - .023
Tactile	Total	.41**	.022*	-.013	.009	.0004 - .019
Tactile	Amnesia	.26*	.022	-.010	.006	-.002 - .016
Tactile	Absorption	.50**	.016*	-.012	.008	-.0003 - .019
Tactile	Taxon	.30*	.025*	-.011	.007	-.0001 - .018
Olfactory	Total	.41**	.019*	.009	.008	.0005 - .020

Olfactory	Depersonalisation	.38*	.014	.011	.005	-.0001 - .014
Olfactory	Amnesia	.26*	.018	.012	.005	-.0003 - .016
Olfactory	Absorption	.50**	.016*	.008	.008	.006 - .022
Olfactory	Taxon	.30*	.022*	.010	.006	-.0002 - .018
Gustatory	Total	.41**	.021*	-.014	.009	.001 - .020
Gustatory	Absorption	.50**	.019**	-.015*	.010	.002 - .022

Note: Simple mediation model with unstandardized *B* reported. The relationship between childhood abuse and the mediator (M) is represented by *a*, the relationship between the mediator and the dependent variable (Y) is represented by *b*, the indirect effect is represented by *ab*, the direct effect is represented by *c`* and CI 95% is the confidence interval. N = 48, *p<.05, **p<.01.

Visual hallucinations were mediated by dissociation total, depersonalisation and DES Taxon in both the DID group and the schizophrenia group. Amnesia was a mediator only in the DID group and absorption was a mediator only in the schizophrenia group. In the DID group taxon had the strongest indirect effect, whereas in the schizophrenia group the strongest indirect effects were dissociation total and depersonalisation.

Tactile hallucinations were mediated by total dissociation in both the DID and schizophrenia groups. In addition, in the DID group depersonalisation, amnesia and DES Taxon were also mediators. Depersonalisation and DES Taxon were the strongest mediators in the DID group.

Olfactory hallucinations were mediated by dissociation total in both the DID and schizophrenia groups. Depersonalisation, amnesia and DES Taxon were also mediators in the DID group, with DES Taxon having the strongest indirect effect. In the schizophrenia group absorption was also a mediator.

Gustatory hallucinations were not mediated by any of the dissociation metrics in the DID group. However, in the schizophrenia group gustatory hallucinations were mediated by both dissociation total and absorption.

Discussion

Overview

This study set out to examine the link between childhood abuse, dissociation and auditory hallucination frequency and distress in participants with either DID or schizophrenia. Consistent with other research (Dorahy et al., 2009; Laddis & Dell, 2012), the first hypothesis was supported with the DID group having higher childhood abuse and dissociation when compared to the schizophrenia group.

Hypotheses two through four were partially supported as while childhood abuse was positively associated with dissociation in both groups (hypothesis three) it was not positively associated with any of the measures of auditory hallucination frequency or distress (hypothesis two). In addition, dissociation total was only positively associated with one measure of auditory hallucination frequency (Voices1) and with associated distress in the DID group (hypothesis four). Once dissociation was split into its subscales, depersonalisation and DES Taxon were positively associated with all measures of auditory hallucination frequency and distress in the DID sample (hypothesis four). However, absorption was not positively associated with auditory hallucination frequency or distress and amnesia was positively associated only with one measure of frequency (Voices1) (hypothesis four). In the schizophrenia group, dissociation total was not positively associated with any of the measures of auditory hallucination frequency and distress (hypothesis four). When dissociation was split into its subscales in the schizophrenia group Voices1 was related to DES Taxon and depersonalisation.

Hypothesis Five was not supported as total dissociation was not a mediator in any of the analyses in the DID or schizophrenia samples. Hypothesis Six was partially supported as depersonalisation mediated the relationship between childhood abuse and auditory

hallucination distress in the DID group. In addition, it mediated the relationship between childhood abuse and one measure of auditory hallucination frequency (Voices1) in the schizophrenia group. Hypothesis Seven was partially supported as DES Taxon mediated the relationship between childhood abuse and one measure of auditory hallucination frequency (Voices1) in the DID group. Hypothesis Eight was partially supported as at least one dissociation metric was a mediator of the relationship between childhood abuse and non-auditory hallucination for every modality except gustatory in the DID group and for every modality in the schizophrenia group.

Childhood Abuse and Auditory Hallucinations

This study did not find a positive correlation between childhood abuse and the *frequency* of auditory hallucinations or the *distress* associated with auditory hallucinations in a sample of people with DID or schizophrenia who experience voices. This contrasts with the results of multiple studies that have evidenced a positive correlation between childhood abuse and auditory hallucinations (Perona-Garcelan et al., 2012a, Perona-Garcelan et al., 2014; Read et al., 2003; Yamasaki et al., 2016). These studies used non-clinical and psychotic samples where a varying percentage of participants did not experience auditory hallucinations. In contrast, all participants in the current study endorsed hearing auditory hallucinations. Thus, other studies where a relationship was found between childhood abuse and auditory hallucinations assessed essentially the presence or absence of voices and so were not targeted on voice hearing frequency specifically, and the positive relationship suggests heightened early abuse in those with auditory hallucinations. This study in contrast measured frequency of experiencing auditory hallucinations and the associated distress, not presence or absence. In finding no correlation between childhood abuse and auditory hallucination frequency or distress, this indicates that while childhood abuse increases the

likelihood of experiencing auditory hallucinations, it seems less related to the frequency or the distress associated with auditory hallucinations.

Measures of Frequency

This study used two different measures of auditory hallucination frequency; "Voice1" and "Frequency". These two measures of frequency yielded different results in relation to both correlations and mediations. In the DID group Voices1 was positively correlated with all measures of dissociation except absorption, whereas Frequency was positively correlated with only depersonalisation and DES Taxon. In the schizophrenia group Voices1 was positively correlated with depersonalisation and DES Taxon, whereas Frequency was not correlated with any of the dissociation metrics. In the mediation analyses there were two successful mediation models with Voices1 as the outcome variable. In the DID group this was the relationship between childhood abuse and Voices1 being mediated by DES Taxon and in the schizophrenia this same relationship was mediated by depersonalisation. Alternatively, Frequency was not a dependent variable in any successful mediation analyses in either group.

One of the differences between these two measures is that Voices1 was a single question, "Have you ever heard voices that you suspect others don't hear or report hearing?" and Frequency is a subscale of the PSYRATS that is made up of scores on three separate questions, "How often are the voices present?", "How long do the voices last?" and "How do the voices disrupt your life?". Thus, Frequency not only captures frequency, but also duration and impact. Frequency was therefore a broader construct that Voices1, which may explain the difference in results. Yet, when the single specific frequency question from the Frequency subscale, "How often are the voices present?" (PSYRATS A1), was tested in the successful mediation models where Voices1 was the dependent variable in lieu of Voices1, the

mediations were no longer significant. This showed that the difference between measures held even when they both defined frequency more narrowly.

There was a moderate correlation between Voices1 and both Frequency and PSYRATS A1 which indicates that they are tapping similar but different constructs. This difference becomes more obvious with a closer look at the questions and the possible responses. Voices1 makes a reference to a lifetime measure of frequency when its asks, "Have you ever". In contrast, the Frequency measure is asking about current experience by enquiring "How often are". In addition, the possible responses are different across the two measures. They both operate on 5-point Likert scales, but the first option in Voices1 is, "Never" as compared to PSYRATS A1 where the first option is, "Voices not present or present less than once a week". This is an important difference as someone who has never experienced an auditory hallucination would endorse the same response as someone who has heard voices consistently throughout their life but less the once a week. Overall, these two measures are accessing slightly different aspects of frequency, and the one with a larger temporal scope had its connection with child abuse mediated by pathological dissociation in DID and depersonalisation in schizophrenia. The measure more specifically focused on current experiences was not mediated by dissociation. Dissociation has been linked to current experiences of auditory hallucination in a study using experiential sampling methods in those with a psychotic disorder (Varese, et al., 2011). Future research should examine if dissociation differentially mediates between child abuse and lifetime versus current frequency of voice hearing.

Auditory Hallucination Mediation Models

There were three relationships involving auditory hallucinations that were mediated by dissociation in this study. The first was for the DID group where the relationship between childhood abuse and the distress associated with auditory hallucinations was mediated by

depersonalisation. This indicates that as childhood abuse increases the distress associated with auditory hallucinations increases through the mechanism of depersonalisation. This is in contrast to Escudero-Perez et al. (2016) who found correlations between absorption and auditory hallucination *distress*, with depersonalisation a predictor of severity of auditory hallucinations. In the current study absorption was not a factor associated with distress. Yet, the Escudero-Perez (2016) sample included psychotic disorders and people with Borderline Personality Disorder. Seemingly different manifestations of dissociation may act as mediators between child abuse and distress associated with voices in different clinical samples. For DID, pathological dissociation was the mediator. In the schizophrenia group in this study auditory hallucination distress was not associated with any dissociation metric and consequently a mediation analysis was not tested.

The other two successful mediation analyses in this study were for the relationship between childhood abuse and auditory hallucination frequency. This relationship was mediated by DES Taxon in the DID group and by depersonalisation in the schizophrenia group. Thus again, different manifestations of dissociation mediated in the different groups.

The mediation by depersonalisation in the schizophrenia group was expected as this replicates the work of Perona-Garcelan et al. who found that depersonalisation was a mediator between abuse and the presence of auditory hallucinations in a psychosis sample (2012a) and in a non-clinical sample (2014). This lends support to the model that as childhood abuse increases the likelihood and frequency of auditory hallucinations through the mechanism of depersonalisation in psychosis and psychosis-prone samples.

The DID group is of interest as this relationship was not mediated by depersonalisation, but by DES Taxon. This measure has been considered to be representative of pathological dissociation rather than being isolated to one form of symptoms or

experiences (Waller et al., 1996). The DES-T has been conceptualised as largely representing dissociative divisions at the level of personality (Steele, Dorahy, Van der Hart & Nijenhuis, 2009) and as such may also be a measure of structural dissociation. Thus, the frequency of voices in DID and its connection with child abuse seems to be mediated by pathological dissociation and arguably the frequency of structural dissociative symptoms in DID. The difference between the DID mediation model and the schizophrenia mediation model suggests that the process by which childhood abuse increases the likelihood of auditory hallucination frequency is broadly pathological (and structural) dissociation in DID and specifically depersonalisation (and non-structural dissociation) in schizophrenia. Laddis and Dell (2012) did not find a significant correlation between childhood trauma and dissociation in their schizophrenia group, whereas this study found significant correlations between childhood abuse and all dissociation metrics in both the DID and schizophrenia groups. Overall, this indicates that different levels and types of dissociation in DID and schizophrenia may act as the mechanism from child abuse to auditory hallucinations.

Overall, the auditory hallucination findings from this study are consistent with the theory postulated by Moskowitz and Corstens (2007) that auditory hallucinations are dissociative in nature (see also Longden et al., 2012) and that following trauma dissociation results in thoughts being experienced as not belonging to the person and being heard as a voice.

Non-auditory hallucinations

This study investigated the frequency of non-auditory hallucinations in a sample where auditory hallucinations were experienced and found that non-auditory hallucinations were endorsed more in the DID group than the schizophrenia group across the hallucination modalities. If non-auditory hallucinations are related to childhood abuse and dissociation in a comparable way to auditory hallucinations, then it would be expected the DID group would

have higher levels of non-auditory hallucination as they also have higher levels of childhood abuse and dissociation.

This study also adds to the research base about which non-auditory hallucination modality is most common. Previous research has indicated that visual hallucinations are the most common in psychosis (Longden et al., 2016) and this study produced a similar result. However, in the DID group the frequency of visual, tactile and olfactory hallucinations were similar but less frequent than tactile hallucinations, which were the most common. Perhaps, tactile hallucinations are more common in a DID sample due to the higher levels of childhood abuse involving physical and sexual attack on the body. This was supported by this study as in the DID sample tactile hallucinations were only correlated with physical abuse (r = .39, p = .007) and sexual abuse (r = .35, p = .017) and not with the other types of abuse and neglect; emotional abuse (r = .13, p = ns), emotional neglect, (r = -.14, p = ns) and physical neglect (r = .21, p = ns). This was in contrast with the schizophrenia sample where tactile hallucinations were not correlated with any abuse type (r*'s* < .010).

Non-auditory hallucination mediation models

This study found that dissociation is a mediator of the relationship between childhood abuse and non-auditory hallucinations. In contrast to the mediation analyses for auditory hallucinations that only produced one dissociation mediator for each outcome measure (i.e., DES-T, depersonalisation), the mediation models for non-auditory hallucinations generated multiple dissociation mediators.

Frequency of hallucinations may have contributed to the mediation results, especially in the DID group. The three modalities that have the highest frequency in DID; visual, tactile and olfactory each were mediated by four dissociation metrics (dissociation total, depersonalisation, DES Taxon and amnesia). However, gustatory hallucinations were not

mediated by any dissociation metrics and they also were the least commonly endorsed hallucination in the DID group. The results from the schizophrenia group challenges whether frequency is a factor as gustatory hallucinations were also the least common in this group and the relationship between childhood abuse and gustatory hallucination was mediated by dissociation total and absorption in the schizophrenia group.

Some mediators were associated more with one diagnostic group than the other. In the DID group, DES Taxon, depersonalisation and amnesia were all mediators of the relationships between childhood abuse and visual, tactile and olfactory hallucinations. Absorption was not a mediator in any of the DID analyses. However, in the schizophrenia group absorption was the most common mediator as it mediated the relationship between childhood abuse and visual, olfactory and gustatory hallucinations. In addition, amnesia was not a mediator in any of the schizophrenia group analyses and depersonalisation and DES Taxon were only mediators of the relationship between childhood abuse and visual hallucinations. This study appears to show that absorption is a mechanism for non-auditory hallucination development only in the schizophrenia group and that amnesia is a mechanism for non-auditory hallucination development only in the DID group. Amnesia and some forms of depersonalisation are considered manifestations of structural dissociation (e.g., Dorahy & Palmer, 2015) and maybe a marker of its presence. Thus, like voices, non-auditory hallucinations seem to be connected with child abuse not directly but via structural dissociation manifestations in DID (e.g., amnesia, DES-T) and non-structural dissociation in schizophrenia. Consequently, most hallucination modalities can be conceptualised as dissociative, but the dissociative mechanisms may be different in different diagnostic groups.

To further elucidate the role of depersonalisation in each diagnostic group a further analysis was conducted with the answers to five depersonalisation items in the DES split into three categories; never (answers of zero), non-clinical levels (answers of 5 – 29) and clinical

levels (answers of 30 and over). The cut off point of 30 to indicate clinical levels of dissociation is taken from Carlson and Putnam (1993) who suggested this as a predictive cut off point. Then the five items were ranked for how frequently people scored within each category for both the DID and schizophrenia groups (see Appendix L for table). It is worth noting that the level of depersonalisation indicated on all five items was higher for the DID group. What is of interest is the ranking of each item rather than the level. Item 12, "Some people have the experience of feeling that other people, objects and the world around them are not real" was the item that got the most never responses in the DID and the item that got the least clinical responses in the DID group. However, in the schizophrenia group it got the least never responses and the second highest level of clinical responses. Item 28, "Some people sometimes feel as if they are looking at the world through a fog so that people and objects appear far away or unclear" was the item that got the highest percentage of clinical responses in the schizophrenia group and was the third highest item in the clinical responses in the DID group. Items 7, "Some people sometimes have the experience of feeling as though they are standing next to themselves or watching themselves do something and they actually see themselves as if they were looking at another person", 11, "Some people have the experience of looking in a mirror and not recognising themselves" and 13, "Some people have the experience of feeling that their body does not seem to belong to them" are all endorsed at a clinical level at higher rankings in the DID group compared to the schizophrenia group. Items 12 and 28 are assessing derealisation specifically and these items are the most likely to be endorsed at a clinical level in the schizophrenia group and in the DID group are the fifth and third most commonly endorsed item at the clinical level. There are very small percentage differences associated with different rankings, some as low as 1% so this tentatively suggests that derealisation may be an important mechanism in

schizophrenia. Further research is needed to replicate this finding and continue to investigate the role of derealisation.

Interestingly, absorption was not a mediator of the relationship between childhood abuse and auditory hallucination frequency and distress as it was not associated with any of the auditory hallucination measures. This contrasts with previous research that found that absorption was a mediator in non-clinical samples (Cole et al., 2016; Perona-Garcelan et al., 2014). Similarly, amnesia was not a mediator in the auditory hallucination analyses. This suggests that perhaps there are different dissociative mechanisms at work in auditory and non-auditory hallucinations in schizophrenia.

Overall, the relationship between childhood abuse and both auditory and non-auditory hallucination frequency is mediated by dissociation. There seems to be slightly different mechanisms at play between auditory and non-auditory hallucinations and between diagnostic groups, but the mechanisms are dissociative in nature and back up the claim by Moskowitz and Corstens (2007) that auditory hallucinations are dissociative in nature and adding to this, it appears that non-auditory hallucination may also be dissociative in nature. In DID, structural dissociation seems most related to hallucinations and in schizophrenia hallucinations seem to be more associated with non-structural dissociation.

Implications and Future Research

There are clinical implications that arise from this study; the first of which is that clinicians need to consider the role of childhood abuse and dissociation when working with people with hallucinations regardless of the diagnosis. Initially, this is about screening for childhood abuse and dissociation (Read et al., 2005). In addition, psychological therapies should attend to abuse and dissociation when working with people experiencing hallucinations.

The results showing mediation of the relationship between childhood abuse and non-auditory hallucinations need to be replicated. This could include looking at different types of childhood abuse and whether they may be hallucination modality specific.

Absorption appears to be a mechanism by which non-auditory hallucinations develop in people with schizophrenia and others have found a link with it and auditory hallucinations in non-clinical samples (Cole et al., 2016, Perona-Garcelan et al., 2014). Further research on the role of absorption would be useful to understand how this is operating. In addition, efforts could be made to replicate whether structural manifestations of dissociation are related to hallucinations in DID and non-structural in schizophrenia.

Limitations

This study had several limitations. Firstly, it did not find a significant relationship between childhood abuse and auditory hallucination frequency and distress. Nor, did it find a consistent relationship between childhood abuse and non-auditory hallucinations. This is not consistent with previous research in this area which has found a direct relationship between childhood abuse and hallucinations (Cole et al., 2016, Perona-Garcelan et al., 2012a, 2014 & Pilton et al., 2015). One interpretation of this may be that while childhood abuse does not have a direct effect on hallucinations it can increase dissociation and that dissociation can then increase the likelihood of experiencing hallucinations.

This study used self-report measures and a correlational design rather than an experimental or longitudinal design, and as such any assumptions about causality must be cautiously interpreted.

Conclusions

This study aimed to extend the current literature base concerning mediation of the relationship between childhood abuse and hallucinations. Auditory hallucination frequency

was mediated in both groups by dissociation, and that auditory hallucination distress was mediated in the DID group. The findings also showed that the specific kind of dissociative mechanism appears to be different for DID and schizophrenia, with the DID sample having more structural manifestations and the schizophrenia group more non-structural manifestations.

Non-auditory hallucination were also found to be mediated by dissociation in this study. Interestingly, these mediation models showed different potential dissociative mechanisms at play in the DID group compared to the schizophrenia group, in addition to different mechanisms between auditory and non-auditory hallucinations. This study appears to demonstrate that hallucinations are dissociative in nature but may vary in which type of dissociation is most important. This study may lead to further research on abuse, dissociation and non-auditory hallucinations in addition to changes in how clinicians formulate and treat people who experience hallucinations.

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Appendices

Appendix A

Demographics

1. What is your sex? M F

2. What is your age? _____

3. What is your employment status?
   a. Employed full time
   b. Employed part time
   c. Unemployed
   d. Student
   e. Sickness beneficiary
   f. Other, please state _____

4. What is your marital status?
   a. Married/de facto relationship
   b. Separated/Divorced
   c. Single

5. What medications are you taking for your psychological difficulties?
   _____

6. What is your ethnicity?
   _____

Appendix B

Childhood Trauma Questionnaire (CTQ)

CTQ Identification_____ Age_____ Sex_____

When I was growing up…		Never True	Rarely True	Sometimes True	Often True	Very Often True
1. I didn't have enough to eat.		•	•	•	•	•
2. I knew that there was someone to take care of me and protect me.		•	•	•	•	•
3. People in my family called me things like "stupid", "lazy" or "ugly."		•	•	•	•	•
4. My parents were too drunk or high to take care of the family.		•	•	•	•	•
5. There was someone in my family who helped me feel I was important or special.		•	•	•	•	•
6. I had to wear dirty clothes.		•	•	•	•	•
7. I felt loved.		•	•	•	•	•
8. I thought that my parents wished I had never been born.		•	•	•	•	•
9. I got hit so hard by someone in my family that I had to see a doctor or go to hospital.		•	•	•	•	•
10. There was nothing I wanted to change about my family.		•	•	•	•	•
11. People in my family hit me so hard that it left me with bruises or marks.	- Before the age of 13	•	•	•	•	•
	- After the age of 18	•	•	•	•	•
	- In the past 6 months	•	•	•	•	•
12. I was punished with a belt, a board, a cord, or some other hard object.		•	•	•	•	•
13. People in my family looked out for each other.		•	•	•	•	•
14. People in my family said hurtful or insulting things to me.		•	•	•	•	•
15. I believe that I was physically abused.	- Before the age of 13	•	•	•	•	•
	- After the age of 18	•	•	•	•	•
	- In the past 6 months	•	•	•	•	•
16. I had the perfect childhood.		•	•	•	•	•
17. I got hit or beaten so badly that it was noticed by someone like a teacher, neighbour or doctor.		•	•	•	•	•
18. I felt that someone in my family hated me.		•	•	•	•	•
19. People in my family felt close to each other.		•	•	•	•	•
20. Someone in my family touched me in a sexual way, or made me touch them.	- Before the age of 13	•	•	•	•	•
	- After the age of 18	•	•	•	•	•
	- In the past 6 months	•	•	•	•	•
21. Someone threatened to hurt me or tell lies about me unless I did something sexual with them.		•	•	•	•	•
22. I had the best family in the world.		•	•	•	•	•
23. Someone tried to make me do sexual things or watch sexual things.		•	•	•	•	•
24. Someone molested me.		•	•	•	•	•
25. I believe that I was emotionally abused		•	•	•	•	•

26. There was someone to take me to the doctor if I needed it.		•	•	•	•	•
27. I believe that I was sexually abused	- Before the age of 13	•	•	•	•	•
	- After the age of 18	•	•	•	•	•
	- In the past 6 months	•	•	•	•	•
28. My family was a source of strength and support.		•	•	•	•	•

Appendix C

INFORMATION ABOUT VOICES	
1. Have you ever heard voices that you suspect that others don't hear or report hearing?	1= Never, 2= Occasionally, 3= Sometimes, 4= Often, 5= Always. If 'Never', go to question 29
2. How old were you when you first started hearing voices?	Answer:_____
3. Do you hear male, female and child voices?	1=Male only, 2=female only, 3=child only, 4=male-female, 5=male-child, 6=female-child, 7=all 3
4. If you hear male, female and/or child voices, which one is loudest?	1=Male, 2=Female, 3=Child, 4=All equally loud
5. If you hear male, female and/or child voices, which one says the most hurtful things to you?	1=Male, 2=Female, 3=child, 4=All do
6. Does what the voices say remind you of anyone in your life?	1=Yes, 2=No; who_____
7. Are you aware of hearing a voice that is specifically recognizable as the voice of your father?	1=Yes, 2= No
8. Are you aware of hearing more than one voice that represents your father?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
9. Are you aware of hearing a voice that is specifically recognizable as the voice of your mother?	1=Yes, 2= No
10. Are you aware of hearing more than one voice that represents your mother?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
11. In what way have the voices changed since you started hearing them?	Answer:_____
12. Can you engage in dialogue with voices you hear? That is, can you speak to them and they speak back to you?	1= Never, 2= Occasionally, 3= Sometimes, 4= Often, 5= Always.
13. Do you ever actively set out to engage in conversation with the voices?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
14. Do you hear voices that speak in another language?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always

15. Would you miss the voices if they were no longer heard?	1=Yes, 2= No
16. Have the voices become more understandable because of therapy?	1=Yes, 2= No
17. In the process of having therapy/treatment, has the frequency of hearing voices changed?	1=Increased, 2=Stayed much the same, 3=Decreased, 4=Ceased?
18. Do you ever hear the voice(s) of your therapist(s)?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
19. Do you ever hear voices that say positive or encouraging things?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
20. If you hear voices commenting or arguing in your head what is the average noise level of these internal voices?	0 (absolute silence) 1 2 3 4 5 6 7 8 9 10 (as loud as standing next to a band playing at a party)
21. If you hear voices commenting or arguing outside your head what is the average noise level of the external voices that you hear?	0 (absolute silence) 1 2 3 4 5 6 7 8 9 10 (as loud as standing next to a band playing at a party)
22. If you hear external voices, are they heard more frequently in the right ear, the left ear, or are they heard equally in both ears?	1=always in the left ear, 2=more often in the left but sometimes in the right, 3=equally in both ears, 4=more often in the right but sometimes in the left, 5=always in the right ear.
23. When you hear voices, do you feel detached or separated from yourself?	1= Never, 2= Occasionally, 3= Sometimes, 4= Often, 5= Always.
NOISES	
24. Do you hear noises (not voices) when there is no obvious cause for experiencing such noises?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always If 'never', go to Question 34
25. If you hear such noises, describe what you most commonly hear.	Answer:_____
26. If you hear such noises, where do you hear the noise(s)?	1=Inside your head, 2=Outside your head, 3=Both.
27. If you hear such noises, are they associated with traumatic memories of past events?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
OTHER	
28. Do you experience visions that speak to you?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
29. Do you feel that you own your body?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always

30. If there are times when you don't feel that you own your body, do voices comment on who does own your body?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
31. When you look in a mirror do you ever see someone who is not your adult self?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
32. If you see someone else, or someone of a different age, describe who you see.	Answer:_____
33. Does the person(s) you see in the mirror, ever talk to you?	1= Never, 2= occasionally, 3= Sometimes, 4= Often, 5= Always
34. If the person(s) you see in the mirror talks to you, where do you hear the voice(s)?	1=Inside your head, 2=Outside your head, 3=Both.

Appendix D

Dissociative Experiences Scale (DES)

These questions describe experiences that you may have in your daily life. Your answer should show how often these experiences happen to you when you **ARE NOT** under the influence of alcohol or drugs. CIRCLE a number from 0% to 100% to show what percentage of the time this happens to you. If it happens 45% of the time, circle both 40% and 50%.

Date_____ Age_____ Sex: M F

1. Some people have the experience of driving or riding in a car or bus or subway and suddenly realising that they don't remember what has happened during all or part of the trip.

   (NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

2. Some people find that sometimes they are listening to someone talk and they suddenly realise that they did not hear part or all of what was said.

   (NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

3. Some people have the experience of finding themselves in a place and having no idea how they got there.

   (NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

4. Some people have the experience of finding themselves dressed in clothes that they don't remember putting on.

   (NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

5. Some people have the experience of finding new things among their belongings that they do not remember buying.

   (NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

6. Some people sometimes find that they are approached by people that they do not know who call them by another name or insist that they have met them before.

   (NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

7. Some people sometimes have the experience of feeling as though they are standing next to themselves or watching themselves do something and they actually see themselves as if they were looking at another person.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

8. Some people are told that they sometimes do not recognise friends or family members.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

9. Some people find that they have no memory for some important events in their lives (for example, a wedding or graduation).

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

10. Some people have the experience of being accused of lying when they do not think that they have lied.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

11. Some people have the experience of looking in a mirror and not recognising themselves.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

12. Some people have the experience of feeling that other people, objects and the world around them are not real.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

13. Some people have the experience of feeling that their body does not seem to belong to them.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

14. Some people have the experience of sometimes remembering a past event so vividly that they feel as if they were reliving that event.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

15. Some people have the experience of not being sure whether things that they remember happening really did happen or whether they just dreamed them.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

16. Some people have the experience of being in a familiar place but finding it strange and unfamiliar.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

17. Some people find that when they are watching television or a movie they become so absorbed in the story that they are unaware of other events happening around them.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

18. Some people find that they become so involved in a fantasy or daydream that it feels as though it were really happening to them.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

19. Some people find that they sometimes are able to ignore pain.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

20. Some people find that they sometimes sit staring off into space, thinking of nothing, and are not aware of the passage of time.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

21. Some people sometimes find that when they are alone they talk out loud to themselves.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

22. Some people find that in one situation they may act so differently compared with another situation that they feel almost as if they were two different people.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

23. Some people sometimes find that in certain situations they are able to do things with amazing ease and spontaneity that would usually be difficult for them (for example, sports, work, social situations, etc.).

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

24. Some people sometimes find that they cannot remember whether they have done something or have just thought about doing this (for example, not knowing whether they have just mailed a letter or have just thought about mailing it).

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

25. Some people find evidence that they have done things that they do not remember doing.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

26. Some people sometimes find writings, drawings, or notes among their belongings that they must have done but cannot remember doing.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

27. Some people sometimes find that they hear voices inside their head that tell them to do things or comment on things that they are doing.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

28. Some people sometimes feel as if they are looking at the world through a fog so that people and objects appear far away or unclear.

(NEVER) 0% 10 20 30 40 50 60 70 80 90 100 (ALWAYS)

Appendix E

Psychotic Symptom Rating Scales (PSYRATS)

I am going to ask you a few questions about auditory hallucinations and delusions which you may or may not experience. Auditory hallucinations are experiences when you hear things that aren't really there and that other people don't hear. They may be voices or just noises. Delusions are beliefs that you hold with strong conviction, even though there is strong evidence that they are not true.

A Auditory hallucinations

1 Frequency – How often are the voices present?

0. Voices not present or present less than once a week

1. Voices occur for at least once a week

2. Voices occur at least once a day

3. Voices occur at least once a hour

4. Voices occur continuously or almost continuously i.e. stop for only a few seconds or minutes

2 Duration – How long do the voices last?

0. Voices not present

1. Voices last for a few seconds, fleeting voices

2. Voices last for several minutes

3. Voices last for at least one hour

4. Voices last for hours at a time

3 Location – Where do you feel that the voices are coming from?

0. No voices present

1. Voices sound like they are inside head only

2. Voices outside the head, but close to ears or head. Voices inside the head may also be present

3. Voices sound like they are inside or close to ears and outside head away from ears

4. Voices sound like they are from outside the head only

4 Loudness – How loud are the voices?

0. Voices not present

1. Quieter than own voice, whispers.

2. About the same loudness as own voice

3. Louder than own voice

4. Extremely loud, shouting

5 Beliefs re-origin of voices – Where do you think the voices are generated from?

0. Voices not present

1. Believes voices to be solely internally generated and related to self

2. Holds <50% conviction that voices originate from external causes

3. Holds ≥50% conviction (but <100%) that voices originate from external causes

4. Believes voices are solely due to external causes (100% conviction)

6 Amount of negative content of voices – How unpleasant is the content of what the voices say?

0. No unpleasant content

1. Occasional unpleasant content (<10%)

2. Minority of voice content is unpleasant or negative (<50%)

3. Majority of voice content is unpleasant or negative (≥50%)

4. All of voice content is unpleasant or negative

7 Degree of negative content – How bad is the content of the voices?

0. Not unpleasant or negative

1. Some degree of negative content, but not personal comments relating to self or family e.g. swear words or comments not directed to self, e.g. ‘the milkman's ugly'

2. Personal verbal abuse, comments on behaviour e.g. ‘shouldn't do that or say that'

3. Personal verbal abuse relating to self-concept e.g. ‘you're lazy, ugly, mad, perverted'

4. Personal threats to self e.g. threats to harm self or family, extreme instructions or commands to harm self or others

8 Amount of distress – How often are the voices distressing?

0. Voices not distressing at all

1. Voices occasionally distressing, majority not distressing (<10%)

2. Minority of voices distressing (<50%)

3. Majority of voices distressing, minority not distressing (≥50%)

4. Voices always distressing

9 Intensity of distress – To what degree are the voices distressing?

0. Voices not distressing at all

1. Voices slightly distressing

2. Voices are distressing to a moderate degree

3. Voices are very distressing, although subject could feel worse

4. Voices are extremely distressing, feel the worst he/she could possibly feel

10 Disruption to life caused by voices – How do the voices disrupt your life?

0. No disruption to life, able to maintain social and family relationships (if present)

1. Voices causes minimal amount of disruption to life e.g. interferes with concentration although able to maintain daytime activity and social and family relationships and be able to maintain independent living without support

2. Voices cause moderate amount of disruption to life causing some disturbance to daytime activity and/or family or social activities. The patient is not in hospital although may live in supported accommodation or receive additional help with daily living skills

3. Voices cause severe disruption to life so that hospitalisation is usually necessary. The patient is able to maintain some daily activities, self-care and relationships while in hospital. The patient may also be in supported accommodation but experiencing severe disruption of life in terms of activities, daily living skills and/or relationships

4. Voices cause complete disruption of daily life requiring hospitalization. The patient is unable to maintain any daily activities and social relationships. Self-care is also severely disrupted.

11 Controllability of voices – How much can you control the voices?

0. Subject believes they can have control over the voices and can always bring on or dismiss them at will

1. Subject believes they can have some control over the voices on the majority of occasions

2. Subject believes they can have some control over their voices approximately half of the time

3. Subject believes they can have some control over their voices but only occasionally. The majority of the time the subject experiences voices which are uncontrollable

4. Subject has no control over when the voices occur and cannot dismiss or bring them on at all

B Delusions

1 Amount of preoccupation with delusions – How much do you think about the beliefs?

0. No delusions, or delusions which the subject thinks about less than once a week

1. Subject thinks about beliefs at least once a week

2. Subject thinks about beliefs at least once a day

3. Subject thinks about beliefs at least once an hour

4. Subject thinks about delusions continuously or almost continuously

2 Duration of preoccupation with delusions – How long do your thoughts about the beliefs last?

0. No delusions

1. Thoughts about beliefs last for a few seconds, fleeting thoughts

2. Thoughts about delusions last for several minutes

3. Thoughts about delusions last for at least 1 hour

4. Thoughts about delusions usually last for hours at a time

3 Conviction – How much do you believe the delusions

0. No conviction at all

1. Very little conviction in reality of beliefs,<10%

2. Some doubts relating to conviction in beliefs, between 10-49%

3. Conviction in belief is very strong, between 50-99%

4. Conviction is 100%

4 Amount of distress – How often do the beliefs cause you distress?

0. Beliefs never cause distress

1. Beliefs cause distress on the minority of occasions

2. Beliefs cause distress on <50% of occasions

3. Beliefs cause distress on the majority of occasions when they occur between 50-99% of time

4. Beliefs always cause distress when they occur

5 Intensity of distress – How distressing do you find the beliefs?

0. No distress

1. Beliefs cause slight distress

2. Beliefs cause moderate distress

3. Beliefs cause marked distress

4. Beliefs cause extreme distress, could not be worse

6 Disruption to life caused by beliefs – How much do the beliefs disrupt your normal life?

0. No disruption to life, able to maintain independent living with no problems in daily living skills. Able to maintain social and family relationships (if present)

1. Beliefs cause minimal amount of disruption to life, e.g. interferes with concentration although able to maintain daytime activity and social and family relationships and be able to maintain independent living without support

2. Beliefs cause moderate amount of disruption to life causing some disturbance to daytime activity and/or family or social activities. The patient is not in hospital although may live in supported accommodation or receive additional help with daily living skills

3. Beliefs cause severe disruption to life so that hospitalisation is usually necessary. The patient is able to maintain some daily activities, self-care and relationships while in hospital. The patient may be also be in supported accommodation but experiencing severe disruption of life in terms of activities, daily living skills and/or relationships.

4. Beliefs cause complete disruption of daily life requiring hospitalization. The patient is unable to maintain any daily activities and social relationships. Self-care is also severely disrupted.

Appendix F

Dissociative Disorders Interview Schedule-Dissociative Identity Disorder (DDIS-DID)

1. Have you ever felt like there are two or more distinct identities or personalities within yourself, each of which has its own pattern of perceiving, thinking, and relating to self and others?

Yes=1 No=2 Unsure=3

2. Do at least two of the identities or personalities recurrently take control of your behavior?

Yes=1 No=2 Unsure=3

3. Have you ever experienced inability to recall important personal information, particularly of a traumatic or stressful nature, that is too extensive to be explained by ordinary forgetfulness?

Yes=1 No=2 Unsure=3

4. Is the problem with different identities or personalities due to substance abuse (e.g. alcohol blackouts) or a general medical condition?

Yes=1 No=2 Unsure=3

Appendix G

Mental Health Research Institute Unusual Perceptions Scale (MUPS)

Response format:

1: Never, 2: A few times, 3: Sometimes, 4: A lot of times, 5: Always.

Have you ever had/do you have:

1a	Have you ever had/do you have: Experiences where you see things that others apparently can't/don't see?	1 2 3 4 5
1b	Do you see a person?	Yes No
1c	Do you see an object?	Yes No
1d	If it is a person, is it someone you have met before?	Yes No
1e	Do you feel like the person will harm you?	Yes No
1f	Do you feel like the person will protect you?	Yes No
1g	Is the person a religious figure?	Yes No
1h	If so, what sort of emotions does this make you feel?	Explain:
2	Have you ever had/do you have: Experiences where you feel things touching you that apparently aren't there?	1 2 3 4 5
3	Have you ever had/do you have: Experiences where you can smell things that others apparently can't smell?	1 2 3 4 5
4	Have you ever had/do you have: Experiences where you can taste certain things that you haven't recently eaten/tasted?	1 2 3 4 5
5a	Did the experiences occur while hearing the voices:	Yes No
5b	Around the same time as hearing the voices	Yes No
5c	Precisely at the same time as the voices	Yes No
5d	Did the onset of the voices occur at the same time, before, after, or at an unrelated time to the other hallucinatory experiences?	Same Before After Unrelated

Appendix H

Invitation Letter

College of Science

Department of Psychology

Tel: +64 3 364 2902, Fax: + 64 364 2181

Email: amy.nesbit@pg.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Invitation letter

Title: Hallucinations, Delusions, and Dissociation in those with psychiatric illnesses.

We are conducting a research study looking at symptoms of some psychiatric illnesses in order to further understand how these differ to other psychiatric illnesses. This study may be of interest to you and more details can be found in this letter.

This letter provides some information about the nature of the research and how to volunteer. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and talk to others about the study if you wish. If you have any questions please ask the person who gave you this letter.

What is the purpose of the study?

We are trying to understand a little more about the symptoms that people with different types of psychological difficulties experience. Data from this study may help provide new knowledge and interventions. We are especially interested in how those with dissociative identity disorder differ from people with other psychiatric problems.

To do this, we are asking people who have a diagnosis of schizophrenia who currently hear voices if they would like to volunteer to help us with a study that looks at these issues.

Do I have to take part?

No, it is up to you whether you decide to take part. If you do want to be involved, please put your name and preferred contact number on the reply slip below and give it to your clinician at your next appointment. Alternatively, you can email or call the either Martin Dorahy (03 3643416; martin.dorahy@canterbury.ac.nz) or Amy Nesbit (ajn39@uclive.ac.nz), who are running the study. If you decide not to take part this will be completely understood and your therapy will not be affected.

What will happen to me if I take part?

If you decide you would like to take part, Amy Nesbit will contact you to arrange an appointment that will be suitable and convenient for you. If you agree to participate you will attend an appointment with Amy who will go through the questionnaires with you (this will take approximately 80-90 minutes. One of these will look at distressing events that you may have experienced in your life. The other questionnaires will ask about some of the experiences and symptoms that you may or may not have had. You will be asked to rate statements on a scale to indicate the extent to which you experience or don't experience them. You will not be asked to read anything or write anything as you will be asked the questions verbally and you say your responses back.

Will my taking part in this study be kept confidential?

Yes. All the information about your participation in this study will be kept confidential.

Contact Details:

You are free to ask any further questions to Amy Nesbit at ajn39@uclive.ac.nz, or her supervisor Prof Martin Dorahy (University of Canterbury) on 3643416 or martin.dorahy@canterbury.ac.nz. If you are interested in participating in this research, please complete the reply slip below and give it to your clinician at your next appointment, or contact Amy or Martin.

Names of research team

Amy Nesbit (Masters of Arts (Psychology) student, University of Canterbury), Rachael Palmer (Masters of Science (Psychology) student, University of Canterbury); Prof Martin Dorahy (Clinical Psychologist; University of Canterbury); Prof Warwick Middleton (Psychiatrist; Belmont Private Hospital); Lenaire Seagar (Psychiatric Nurse; Unit Manager, Belmont Private Hospital).

Reply Slip

I consent to be contacted by a member of the Research team about the research project: ☐

Signed (participant): _____ Date: _____

Print name (participant): _____ Telephone: _____

Appendix I

Information Form

College of Science

Department of Psychology

Tel: +64 3 364 2902, Fax: + 64 364 2181

Email: amy.nesbit@pg.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Participant Information Form

Title: Hallucinations, Delusions, and Dissociation in those with psychiatric illnesses.

You are invited to take part in this study. Please read the information below which outlines what is involved in this research. If you would like to complete this survey, which will take approximately 50-90 minutes, you can give your consent by signing the consent form. This study is being undertaken by Amy Nesbit, Rachael Palmer, Prof Warwick Middleton, Lenaire Seager, and Prof Martin Dorahy, and some of it will form the basis of a Master's thesis (Amy Nesbit). It has been reviewed and approved by the University of Canterbury Human Ethics Committee (Ref: 2013/40). They can be contacted at: **human-ethics@canterbury.ac.nz**, on 03 364 2987, or at Okeover House, University of Canterbury, Christchurch, 8041, New Zealand. This study also has approval from the Southern Health and Disability Ethics Committee.

What is the purpose of the Study?

We are trying to understand a little more about the symptoms that people with different types of psychological difficulties experience. Data from this study may help provide direction for treating the disorders.

Do I have to take part?

No. Participation is voluntary and it is up to you to decide whether to take part. You will receive a $10 voucher if you decide to take part to thank you for your time and participation. You have been invited to participate as you have a diagnosis of either dissociative identity disorder or schizophrenia. If you decide to continue, you are free to withdraw at any time. If you would like to withdraw during the questionnaires please let the researcher know. If you would like to withdraw after the completion of the questionnaires, please contact Amy Nesbit or Martin Dorahy (contact details below). Withdrawing your participation at any time is respected and will not affect your therapy in any way.

What will happen to me if I take part?

Should you decide to take part you will complete several brief questionnaires. These assess feelings, symptoms, and experiences you may or may not have.

How long will it take?

The study will take approximately 50-90 minutes to complete. Amy Nesbit (Psychology Master's student) will conduct the study. There will be some questions about distressing events that may have occurred during your life.

What do I have to do to take part?

If you would like to take part, please ask any questions you may have. After that, please sign the consent form.

What are the possible disadvantages of taking part?

The questionnaires in this study ask questions about symptoms you may experience. One of the questionnaires asks about trauma that you may have experienced or are currently experiencing. Some people may find this distressing. If you are feeling any distress from this study, you will be able to talk to a mental health professional on request. A list of support and counselling services is provided below. Please also feel free to talk to your treating doctor or nurse.

Contact Details:

If you have any further questions about the study please contact Martin Dorahy (Prof; University of Canterbury) on 364 3416 or martin.dorahy@canterbury.ac.nz. If you would like a summary copy of the results once the study is completed, please contact Martin Dorahy.

Name of researchers:

Amy Nesbit (Masters student), Rachael Palmer (Masters student) and Prof Martin Dorahy (clinical psychologist). Department of Psychology, University of Canterbury, Private Bag 4800, Christchurch, 8140. Prof Warwick Middleton (psychiatrist), Lenaire Seager (Psychiatric Nurse). Belmont Private Hospital.

Contacts and Questions:

At this time you may ask any questions you may have regarding this study. If you have questions later, you may contact Martin Dorahy (University of Canterbury) on 364 3416 or martin.dorahy@canterbury.ac.nz

Support services

Samaritans: 0800 726 666

Lifeline: 0800 543 354

Emergency services

Psychiatric Emergency Services: (03) 364 0482

Appendix J

Consent Form

College of Science

Department of Psychology

Tel: +64 3 364 2902, Fax: + 64 364 2181

Email: amy.nesbit@pg.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Consent form- Patient

"Hallucinations, Delusions, and Dissociation in those with psychiatric illnesses."

I have read and understood the description of the above named project, and have had the opportunity to ask questions and have had these answered satisfactorily. On this basis, I agree to participate, with the understanding that confidentiality will be preserved. ☐

I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided, without any negative consequence to myself.☐

I acknowledge that I am 18 years of age or older.☐

I consent to my data be merged with all the other data.☐

I note that the project has been reviewed and approved by the University of Canterbury Human Ethics Committee (Ref: 2013/40) and the Southern Health and Disability Ethics Committee. ☐

Please make sure you have checked all boxes before you sign.

Full Name (please print): _____

Signature: _____

Signature of Researcher: _____

Date: _____

Appendix K

Additional Mediation Analyses

Diagnostic Group	Y	M	*a*	*b*	*c'*	*ab*	CI 95%
DID	PSYRATS A1	Taxon	.66**	.022*	-.009	.015	-.002 - .030
Schizophrenia	PSYRATS A1	Depersonalisation	.38*	.013	-.006	.005	-.002 - .015

Note: Simple mediation model with unstandardized *B* reported. The relationship between childhood trauma and the mediator (M) is represented by *a*, the relationship between the mediator and the dependent variable (Y) is represented by *b*, the indirect effect is represented by *ab*, the direct effect is represented by *c`* and CI 95% is the confidence interval. N = 48, *p<.05, **p<.01.

Appendix L

Ranked Frequency of Answers to Depersonalisation Items from the DES (Highest to Lowest)

DID			Schizophrenia		
0	1	2	0	1	2
12 (28%)	11 (18%)	13 (80%)	11 (70%)	7 (18%)	28 (30%)
11 (16%)	28 (16%)	7 (78%)	13 (66%)	12 (16%)	12 (29%)
13 (12%)	12 (16%)	28 (72%)	28 (62%)	11 (12%)	13 (28%)
28 (12%)	7 (12%)	11 (66%)	7 (62%)	28 (8%)	7 (20%)
7 (10%)	13 (8%)	12 (56%)	12 (55%)	6 (6%)	11 (18%)

Note: Item number (percentage), 0 = never, 1 = 5% - 29% of the time, 2 = 30% of the time and over.